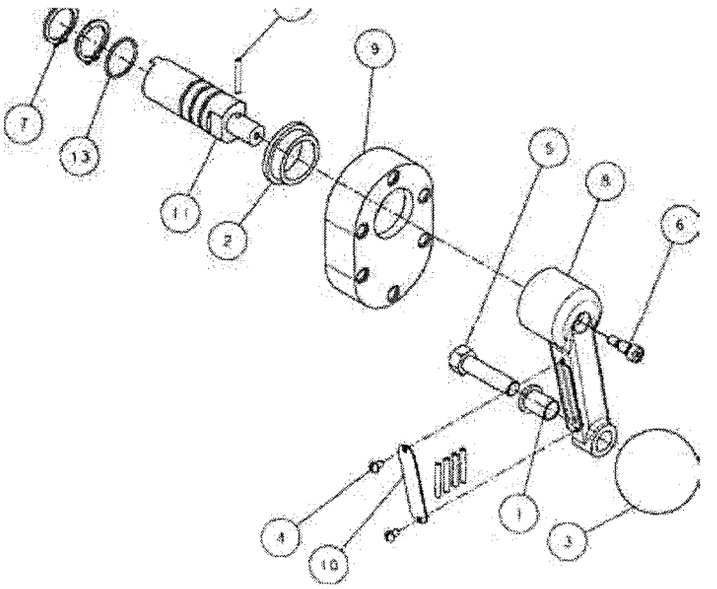
Troubleshooting Guide

TROUBLE	POSSIBLE CAUSE	REMEDY
Motor does not operate	a. No power to actuator	a. Check source, fuses, wiring
	b. Motor overheated and internal thermal switch tripped (single phase AC motors only)	b. Let motor cool and determine why overheating occurred (such as, excessive duty cycle or ambient temperature)
	c. Motor burned out	c. Replace motor and determine cause of failure
	d. Motor drag brake improperly adjusted	d. Adjust as detailed on page 20
	e. Motor drag brake defective	e. Replace drag brake
	f. Both end of travel switches open or one open and one defective	f. Adjust switch settings or replace defective switch
	g. Actuator output shaft stalled	g. Check drive load for mechanical jam and correct cause
	h. Defective motor run capacitor	h. Replace capacitor (AC models)
	i. Load exceeds actuator torque rating	i. Reduce load or replace actuator with one with appropriate torque rating
	j. Power applied to CW & CCW rotation at same time	j. Correct power input problem
	k. Amplifier defective	k. Replace amplifier
	l. Amplifier is in Loss of Signal	l. Check command signal to verif y signal greater than 3.8 mA is present
	m. Amplifier deadband is too wide	m. Reduce deadband setting
Motor hums but does not run	a. Power applied to CW & CCW rotation at the same time	a. Correct power input problem
	b. Damaged power gearing	b. Repair gearing
	c. Defective motor run capacitor	c. Replace capacitor
	d. Motor drag brake	d. Adjust or replace as required
Motor runs, output shaft does not rotate	a. Defective power gearing	a. Repair gearing
Motor does not shut off at limit switch	a. Switch wired wrong or is defective	a. Correct wiring or replaceswitch
	b. Motor phased incorrectly	b. Correct wiring
Actuator backdrives when power is removed	a. Motor drag brake improperly adjusted	a. Adjust as detailed on page 20
	b. Motor drag brake defective	b. Replace drag brake
Handcrank does not move output shaft	a. Power still on	a. Remove power
	b. Load is jammed and motor drag brake slips	b. Remove jammed load
	c. Drag brake missing or improperly adjusted.	c. Replace drag brake

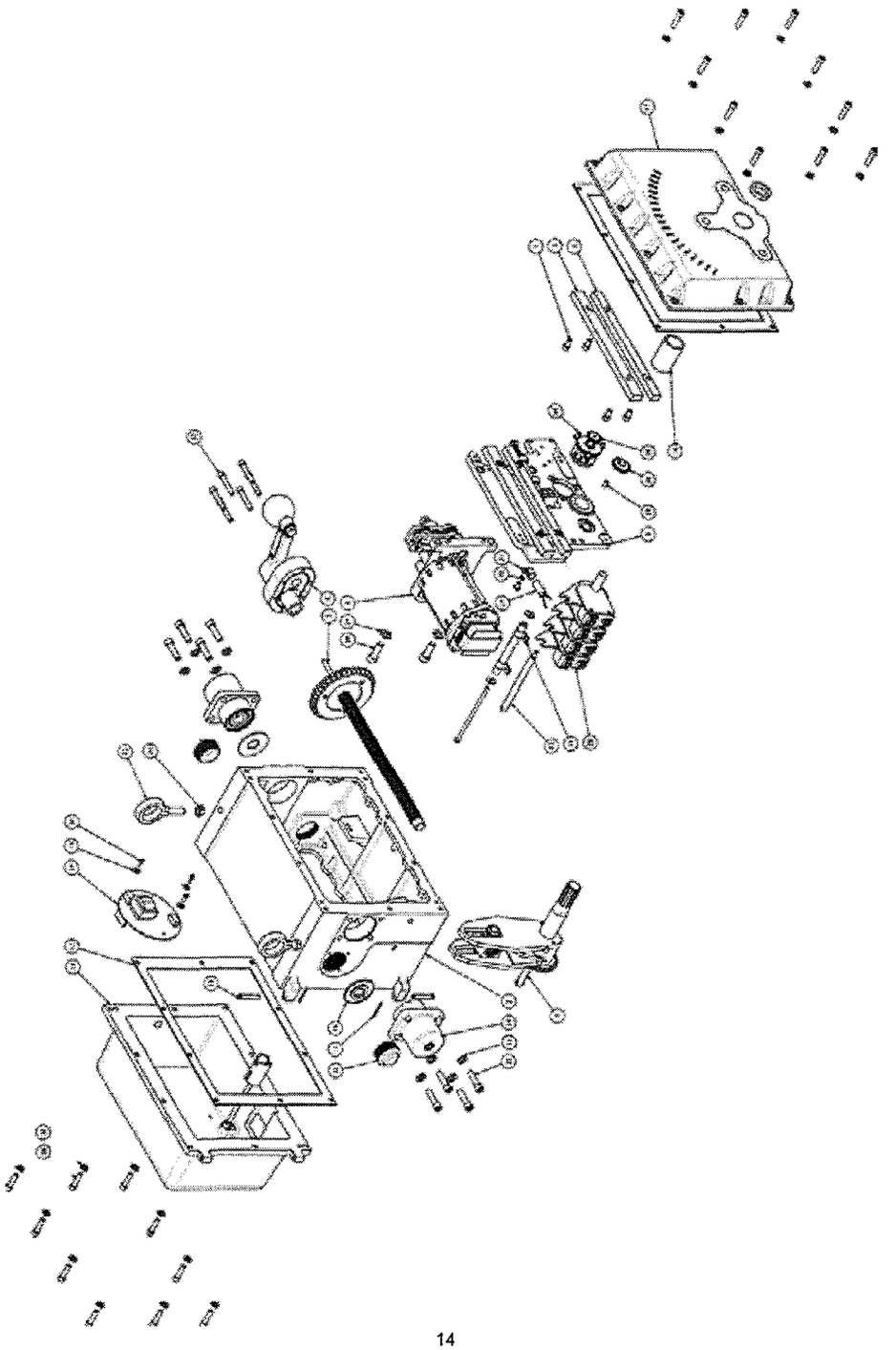
Troubleshooting Guide

Motor runs, but only one way	a. Power not applied for other direction	a. Correct power problem
	b. Power always applied to one direction and electrically stalls when applied for opposite direction	b. Correct power problem
	c. Open limit switch for other direction	c. Adjust or replace limit switch as required
	d. Actuator is torqued out	d. Determine obstruction and correct
	e. Motor has an open winding	e. Replace motor
	f. Motor and feedback potentiometer are out of phase	f. Reverse potentiometer end leads
	g. Amplifier is defective	g. Replace amplifier
Poor response to command signal changes	a. Amplifier deadband is too wide	a. Reduce deadband setting
	b. Amplifier is defective	b. Replace amplifier
	c. Excessive noise on command signal	c. Reduce noise. Also ensure that command signal wiring is shielded with shield grounded at source common only.
	d. Defective feedback potentiometer	d. Replace potentiometer
Actuator oscillates at setpoint	a. Amplifier deadband is too narrow	a. Increase deadband setting
	b. Amplifier is defective	b. Replace amplifier
	c. Excessive noise on command signal	c. Reduce noise. Also ensure that command signal wiring is shielded with shield grounded at source common only.
Pot feedback signal not always present during actuator rotation	a. Pot not aligned with end of travel extremes and is being driven through dead region	a. Align pot to range of actuator
	b. Pot signal is erratic or nonexistent	b. Replace pot
Pot signal does not change as actuator operates	a. Defective pot	a. Replace pot
	b. Feedback gear not turning pot shaft	b. Check gearing engagement and set screw in gear hub
Pot signal is reversed for output shaft rotation	a. Pot is wired wrong	a. Reverse wiring from ends of pot at actuator terminal block
Output shaft rotates wrong direction for CW and CCW input power	a. Wiring to actuator incorrect	a. Correct field wiring
	b. Wiring from motor to terminals or switches is reversed	b. Correct internal actuator wiring
4-20 mA customer feedback missing or non-linear	a. External wiring error	a. Refer to amplifier instruction manual
	b. Power supply fault	b. Refer to amplifier instruction manual
	c. Shunt resistance too light	c. Refer to amplifier instruction manual

Parts Identification



Item	Quantity	Part Number	Description
1	1	18B-SP1988-065	BUSHING
2	1	18B-SP1988-075	BUSHING
3	1	47A-007639-001	KNOB
4	2	54A-015023-025	SCREW RD HEAD #6-32 X .25LG
5	1	54A-015081-150	CAP SCREW HEX HEAD .38-16 X 1.50LG
6	1	54A-015204-038	SCREW SHOULDER SOC HD .25 X .38LG
7	2	58B-014186-098	RET. RING TRUARC #5160-59
8	1	60B-018982-001	HANDLE CRANK
9	1	60B-038887-001	HADN CRANK HOUSING MACHNEMA4
10	1	61A-017891-001	RETAINER PLATE SHEAR PINS
11	1	61A-038877-001	SHAFT
12	5	61A-038895-001	SHEAR PIN
13	1	74B-01957-020	O-RING .88 I.D. X 1.00 O.D.



IP7_040001

Parts Identification

Item	Quantity	Part Number	Description
1	4	54A-015060-050	CAPSCREW SOC HD .25-20 x .50LG.
2	1	60D-019010	CASTING CENTER
3	1	61B-011412-001	SUPPORT RAIL
4	1	61B-011882-001	SUPPORT RAIL
5	1	68B-018992	DRIVE GEAR ASSEMBLY
6	1	68B-038894-001	HANDLE ASSEMB;Y
7	1	68C-036204	OUTPUT SHAFTASSEMBLY
8	1	68C-038912	AC MOTOR ASSEMBLYWITH DRAG
9	1	68D-036211	CENTER SUPPORT ASSEMBLY
10	1	68C-035819-001	AMPLIFIER PCB ASSEMBLY
11	2	57A-033270-019	COTTER PIN
12	2	13C-017985-002	DOOR GASKET
13	2	74A-017486-001	COVER HINGE PIN
14	2	68A-017205	END CAP HOUSING
15	2	74B-010957-033	END CAP SEAL
16	1	18B-003814-035	FRONT BUSHING
17	1	60D-017257-001	FRONT COVER
18	1	19B-003815-002	FRONT SEAL
19	3	58B-024244-095	GENERIC TYPEB FLATWASHER
20	1	74A-016946	HEATER
21	1	74A-016947-001	HEATER CLIP
22	1	54A-015033-038	HEATER SCREW
23	2	58B-024244-002	EYE BOLT
24	2	55A-015089-001	GENERIC REGULAR HEX NUT
25	1	68D-021669	LIMIT SWITCH ASSEBLY
26	1	61A-025809-001	LIMIT SWITCH GEAR
27	1	62A-021667-002	ANCHOR SHAFT
28	1	58B-016181-006	LIMIT SWITCH KEY
29	2	56A-015231-001	WASHER .38
30	20	56A-015211-001	SPLIT RING
31	3	54A-015023-063	GENERIC PAN HEAD SCREW
32	2	52A-024353-001	PIPE PLUG
33	1	60D-017481	REAR COVER ASSEMBLY
34	2	33B-003852	RESISTOR CLIP
35	8	54A-015070-100	SKT HD SCR .31 X 1.25
36	20	54A-015060-100	SKT HD SCR .25 X 1.5
37	6	54A-015060-075	SKT HD SCR .25 X 1.5
38	2	54A-015080-150	SKT HD SCR .38 X 1
39	1	68A-007162	SWITCH ASSEMBLY
40	4	54A-015032-025	SWITCH ASSEMBLYSCREW
41	8	56A-015221-001	WASHER .31

Maintenance

LUBRICATION

Under normal service conditions the motor, gearing, bearings, and parts are all pre-lubricated and should not require periodic maintenance. If for any reason the unit is disassembled in the field, all oilite bushings should be resaturated with an SAE-10, non-detergent oil and all gearing heavily coated with Amoco Rykon Premium Grease #2 or equivalent grease. Care should be taken to ensure that no foreign material is allowed to become combined with the grease in the gear train, which will cause premature failure. Keep gearbox clean and dry.

DRAG BRAKE ADJUSTMENT

The drag brake serves two functions: a) to prevent actuator from backdriving at maximum rated torque; and b) to allow the motor shaft to slip when handcranking and the output shaft load is in excess of rated torque.

The drag brake was factory set and should not need readjustment. If it does need adjustment:

1. Apply an overhung load, equal to the maximum torque rating to the output shaft.
2. Loosen drag brake jam nut until the motor shaft starts to backdrive.
3. Tighten the drag brake jam nut just enough to prevent backdriving.
4. While handcranking against the load, increase the load until motor backdriving occurs.

TORQUE LIMIT SWITCH ALIGNMENT

The torque limit switches are factory set and field adjustment is not advised unless proper test equipment is available. If adjustment must be done, use the following procedure:

1. Load the output shaft with a known load which matches the torque rating of the actuator in an opposing direction for the switch being adjusted.
2. Apply power to the motor and run the actuator to drive the opposing load.
3. Increase the load by 5% to 10% and adjust the set screw (140C) to trip the torque switch.
4. Remove the 5% to 10% increase of load and the switch should reset.
5. Load the actuator in the opposite direction and set the other switch in the same manner.

NOTE: When looking at the torque limit switch assembly as it is mounted in the actuator, the switch on the top of the assembly controls the CW torque and the switch on the bottom controls the CCW torque. The torque should be set near equal for both directions.

When the actuator is driven into a torque condition in the CW direction (looking at the output shaft), the handcrank handle will move slightly outward. For CCW direction the handle will pull slightly inward.

Maintenance

MOTOR REPLACEMENT

1. Disconnect all power to the actuator.
2. Remove screws, washers and rear cover.
3. Disconnect actuator output shaft from driven device and remove actuator from mount.
4. Remove bolts, washers, and front gear case cover. Note location of all gearing.
5. Remove motor pinion.
6. Remove brake assembly from top of motor.
7. Disconnect motor wires - note colors.
8. Remove motor.
9. Reverse the procedure to install new motor. (Clean and regrease all gearing, check bushings and bearings, lubricate bushings with SAE-10, non-detergent oil.)
10. Reinstall the actuator.

POWER GEARING REPLACEMENT

1. Perform steps 1,3 & 4 of Motor Replacement.
2. Remove defective gear(s) and replace with new.
3. Ensure all gearing and oilite bushings are properly lubricated as detailed above.
4. Install front cover and Reinstall actuator.

POSITION LIMIT SWITCH REPLACEMENT

1. Disconnect all power to the actuator.
2. Remove rear cover.
3. Remove two screws and washers from appropriate switch on assembly.
4. Install new switch and transfer wires from old switch one at a time.
5. No realignment should be necessary.

FEEDBACK POTENTIOMETER REPLACEMENT

A. One Turn Linear Potentiometer

1. Disconnect all power to the actuator.
2. Remove screws, washers, and rear cover.
3. Remove three screws holding potentiometer and disc to housing.
4. Pull potentiometer and disc out of housing.
5. Measure location of gear from mounting disc to farthest face of gear and note measurement.
6. Loosen set screws and remove gear.
7. Remove nut and washer holding potentiometer to disc.
8. Cut shaft of new potentiometer to same length as old.
9. Mount new potentiometer on disc, tighten potentiometer nut, install gear to measured dimension from step 5.
10. Install assembly in housing and tighten screws.
11. Using a 25 watt solder iron, remove wires from old potentiometer one at a time and solder to corresponding terminals on new potentiometer.
12. Align potentiometer and install cover.

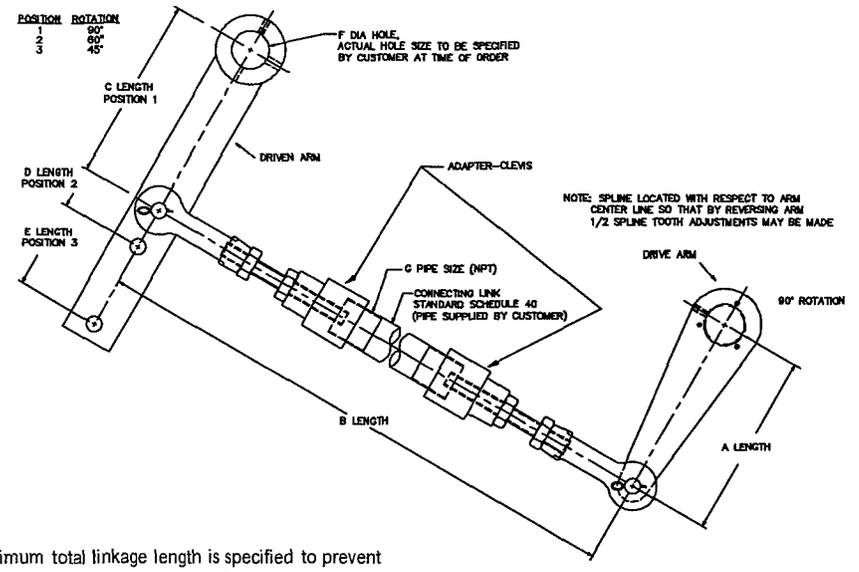
B. Characterized Potentiometer

1. Disconnect power and remove rear cover.
2. Remove three screws and pull potentiometer off of pins.
3. Install new potentiometer and tighten screws.
4. Using a 25 watt solder iron, remove wires from old potentiometer one at a time and solder to corresponding terminals on new potentiometer. **CAUTION - DO NOT USE EXCESSIVE HEAT WHEN SOLDERING.**
5. Align potentiometer and install cover.

C. LVDT Assembly Replacement

1. Same as Characterized Potentiometer replacement above.
2. Align LVDT body for zero output (see alignment procedure, characterized cam adjustment on page 12, step G).

SM-5000 SERIES DRIVE ARM AND LINKAGE OPTIONS

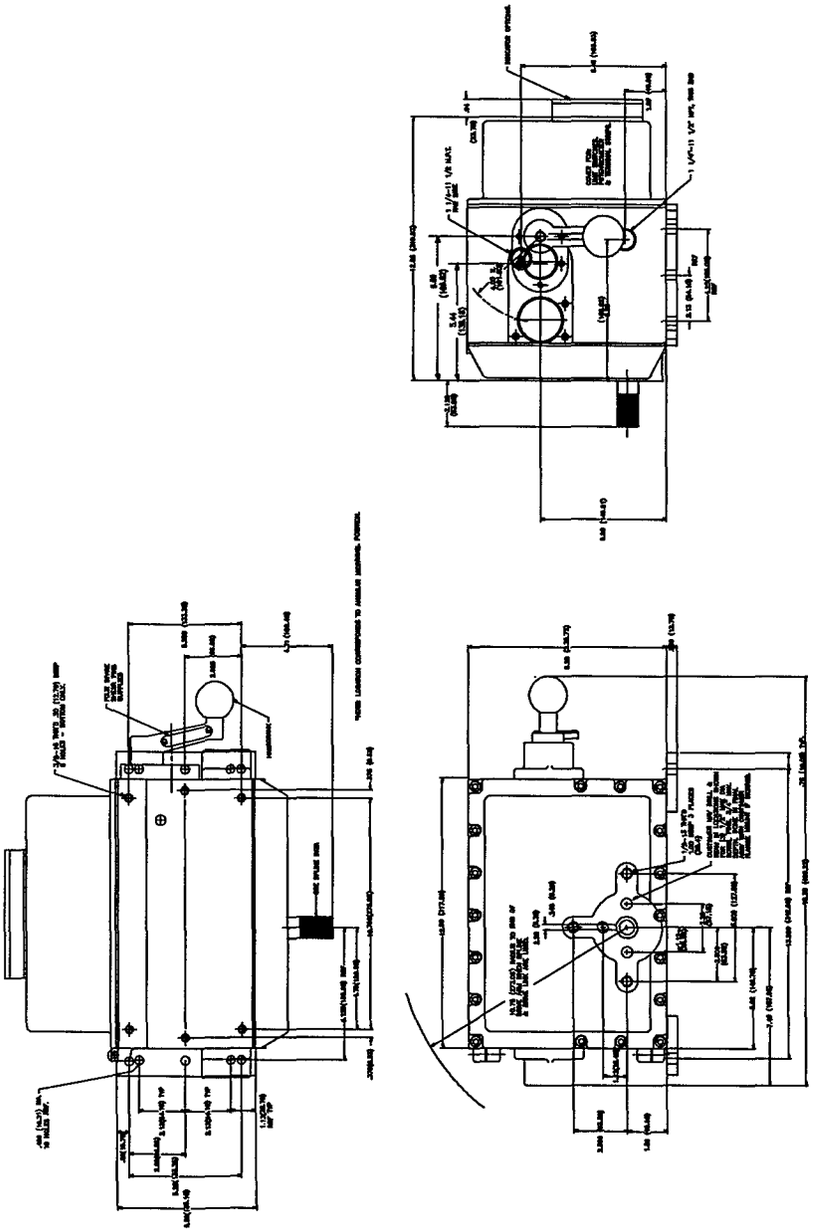


Notes:

1. Maximum total linkage length is specified to prevent buckling under compressive load.
2. Adjustable drive arms are also available to allow "A" length to vary from 6 to 10 inches (152 to 254 mm). In this case, the adapter-clevis has rod ball ends with lubricating fittings.
3. Special drive arm lengths are available to meet application requirements.

"A" LENGTH in. (mm) (See Note 3)	"B" LENGTH ft. (m)	"C" LENGTH in. (mm)	"D" LENGTH in. (mm)	"E" LENGTH in. (mm)	"F" DIA. HOLE min.-max. in. (mm)	"G" PIPE SIZE
10 (254)	18 (5.5)	10 (254)	12.25 (311)	17 (432)	0.75 - 1.5 (19 - 38.1)	1 - 1/4 (NPT)

Major Dimensions



These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. Current installation dimension drawings are available on request.

The dimensions in this manual are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. Current installation dimension drawings are available upon request.

JORDAN CONTROLS, INC.
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Phone: (414) 461-9200
FAX: (414) 461-1024
E-Mail: jordan@jordancontrols.com
IM-0422 4/01

Jordan CONTROLS

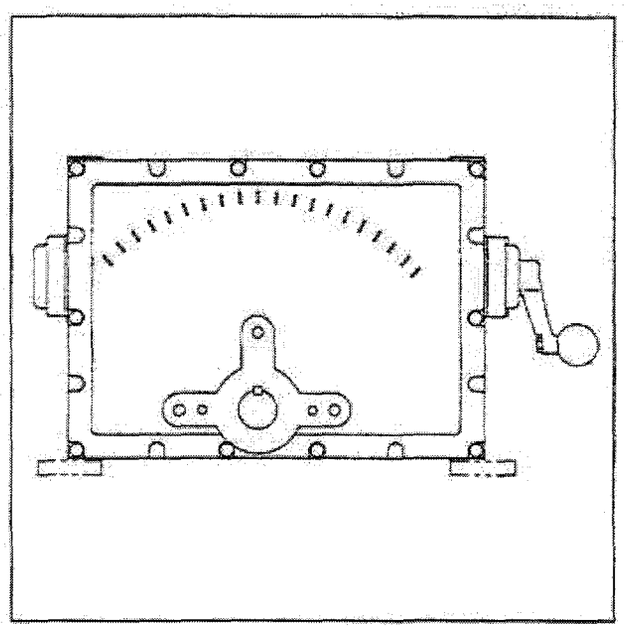
Jordan Controls, Inc.

IM-0464

SM-5200 SERIES

Instruction Manual

ELECTRIC ROTARY ACTUATOR



Due to wide variations in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

Jordan CONTROLS

IP7_040008

GENERAL INFORMATION

TABLE OF CONTENTS

IDENTIFICATION LABEL

An identification label is attached to each actuator cover. The serial number is also stamped on the aluminum housing, directly above the conduit entry. When ordering parts, requesting information, or service assistance, please provide all of the label information.

EXAMPLE:
MODEL NUMBER SM 52 10
CODE: SM5210
SERIAL: 1627C92-23456-1
PH/HZ/V/A: 1/60/120/1

MODEL NUMBER: SM52 10
Actuator Series — Motor Type

CODE: SM5210
Model Series

SERIAL NUMBER: 1627 C 92 - 23456-1
Sequential Number — Month built — Year built — Job Reference No.

PH/HZ/V/A: 1/60/120/1
PH=Phase
HZ=Hertz
V=Voltage
A=Amp

RECEIVING

Once you have received the actuator(s), carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling.

All damage should be immediately reported to the freight carrier and Jordan Controls, Inc.

INSPECTION

Carefully unpack the actuator(s)— taking care to save the shipping carton and any packing material should return be necessary. Verify that the items on the packing list or bill of lading agree with your own.

STORAGE

If the actuator(s) will not be installed immediately, they should be stored in a clean, dry area where the ambient temperature is not less than -20° F. The actuator(s) should not be stored in a corrosive environment.

EQUIPMENT RETURN

For your convenience Jordan Controls, Inc. will provide an efficient method of returning equipment for repair.

Returned Goods Authorization

A returned goods authorization (RGA) number is required to return any equipment for repair. This must be obtained from the Jordan Controls Service Department. The equipment must be sent to the following address after the RGA number is issued:

Jordan Controls, Inc.
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Attn: Service Department

To facilitate quick return and handling of your equipment include:
RGA Number
Your Company Name
Address
Repair Purchase Order Number
Brief description of the problem

INTRODUCTION AND GENERAL DESCRIPTION

INTRODUCTION

Jordan Controls, Inc., designs, manufactures and tests its products to meet many national and international standards. However, for these products to operate within their normal specifications, you must properly install, use and maintain these products. The following instructions must be adhered to and integrated with your safety program when installing, using and maintaining Jordan Controls products:

- Read and save all instructions prior to installing, operating and servicing this product.
- If you do not understand any of the instructions, contact your Jordan Controls representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified on Jordan Controls installation instructions and per applicable local and national codes. Connect all products to the proper electrical sources.
- Handle, move and install each product using the appropriate number of personnel and moving devices/equipment (dolly, forklift, crane, etc.). Failure to do so could cause serious personal injury.
- To ensure proper performance, use qualified personnel to install, operate, update, tune and maintain the product.
- When replacement parts are required, ensure that the qualified service technician uses replacement parts specified by Jordan Controls. Unauthorized substitutions may result in fire, electrical shock, other hazards, or improper equipment operation.
- Keep all actuator protective covers in place, (except when maintenance is being performed by qualified personnel), to prevent electrical shock, personal injury, or damage to the actuator.

CAUTION

Before installing the actuator, make sure the actuator supplied is suitable for the intended application with respect to environmental conditions and the voltage/frequency of available line power. If you are unsure of the suitability of this equipment for your installation, consult Jordan Controls prior to proceeding.

WARNING— SHOCK HAZARD

Installation and servicing must be performed only by qualified personnel. De-energize all sources of power BEFORE removing the actuator cover. KEEP COVER TIGHT WHEN CIRCUITS ARE ALIVE. Failure to follow these precautions may result in serious injury.

GENERAL DESCRIPTION

The SM-5200 series is a line of heavy duty, electrically operated rotary actuators. Available with output torque ratings of up to 1000 foot-pounds (1356 NM) and with or without a built-in servo amplifier, they provide a complete range of positioning control for both indoor and outdoor installations.

These rugged actuators were designed to provide years of maintenance-free operation, modulating the control element in process industries.

BASIC MODELS

SM-5210
240/480 Vac, 3 phase, 50/60 Hz, running current 1.8/.9A, stall current 10.3/5.2A.
Duty cycle
600 ft-lbs output: modulating
1000 ft-lbs output: 20%, maximum 5 minute on-time
Control Compatibility: Three phase bi-directional motor contactor or controller.

SM-5220
120/240 Vac, 1 phase, 50/60 Hz, running current 7.0/3.5A, stall current 13.2/6.6A.
Duty cycle
600 ft-lbs output: modulating
1000 ft-lbs output: 20%, maximum 5 minute on-time
Control Compatibility: Jordan Controls model MT-6220 meter with remote control, model CS-7200 control station, models AD-8823 or AD-8843 servo amplifiers.

SM-5220/AD-8823
120 Vac, 1 phase, 50/60 Hz, running current 7.0A, stall current 13.2A.
Duty cycle
600 ft-lbs output: modulating
1000 ft-lbs output: 20%, maximum 5 minute on-time
Control Compatibility: 4 to 20 mA dc command signal capable of driving a 470 ohm load. Other command signal ranges are available - please consult the factory.

SM-5220/AD-8843
240 Vac, 1 phase, 50/60 Hz, running current 3.5A, stall current 6.6A.
Duty cycle
600 ft-lbs output: modulating
1000 ft-lbs output: 20%, maximum 5 minute on-time
Control Compatibility: 4 to 20 mA dc command signal capable of driving a 470 ohm load. Other command signal ranges are available - please consult the factory.

SM-5260
90 Vdc, (permanent magnet field), 4.7A.
Duty cycle
600 ft-lbs output: modulating
1000 ft-lbs output: 20%, maximum 5 minute on-time
Control Compatibility: Jordan Controls model AD-7300-A (90 Vdc output), servo amplifier.

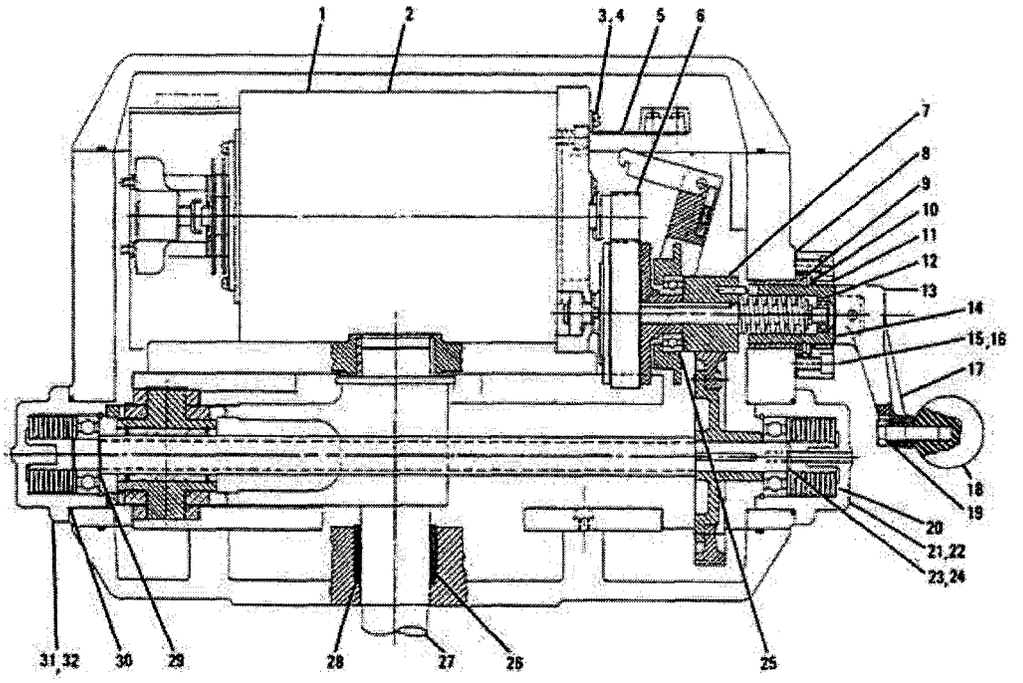


Figure 1

Item	Description	Stock No.	Qty.
1-	SM-5201 Main Assy.	70E-014137	
-1	Motor Bracket Assy, (SM-5210)	68C-014120-001	1
	Motor Bracket Assy, (SM-5220)	68C-014120-002	1
	Motor Bracket Assy, (SM-5250)	68C-014120-003	1
-2	Motor, AC, SM-5210	23D-014664-002	1
	Motor, AC, SM-5220	23D-014664-001	1
	Motor, DC, SM-5250	23D-012363-001	1
-3	Screw, Rd Hd, 10-24 x 0.50"	54A-015043-050	2
-4	Washer, Lock	56A-015201-001	2
-5	Bracket, Terminal	13B-015804-001	1
-6	Pinion Assy	68A-011657-002	1
-7	Clutch Assy, 20 sec./30 sec.	68B-015831-001	1
	Clutch Assy, 50 sec.	68B-018567-001	1
-8	Gasket	74A-011648-001	1
-9	Ring, Retaining (Truarc 5160-98)	58B-014186-150	1
-10	O-Ring	74B-012708-222	1
-11	Bushing	18B-003814-038	1
-12	Bearing	17B-003813-007	1
-13	Handcrank Assy	68B-015434-001	1
-14	Shaft, Override, Manual	61A-010931-001	1
-15	Screw, Cap, Soc Hd, 5/16-18 x 1-1/4"	54A-015070-125	12

Item	Description	Stock No.	Qty.
-16	Washer, Lock, 5/16	56A-015221-001	12
-17	Handcrank	60B-010978-002	1
-18	Knob	47A-007639-001	1
-19	Bushing	18B-SP1968-065	1
-20	Washer, Belleville	56B-010462-004	20
-21	Overload Cap Assy	68B-014671-001	1
-22	Cap, Overload	60B-014670-002	1
-23	Drive Screw Assy, 20 sec.	68B-018576-001	1
	Drive Screw Assy, 30 sec.	68B-018576-002	1
	Drive Screw Assy, 50 sec.	68B-018576-003	1
-24	Screw Drive Sub-Assy, 20 sec.	68B-018561-001	1
	Screw Drive Sub-Assy, 30 sec.	68B-018561-002	1
	Screw Drive Sub-Assy, 50 sec.	68B-018561-003	1
-25	Bearing, Ball	17B-003813-031	1
-26	Bearing, Sleeve, 1-3/4 x 2-1/8 x 1-1/2	68D-014059-001	1
-27	Output Shaft Assy	68D-014069-001	1
-28	O-Ring	74B-012708-224	1
-29	Ring, Retaining (Truarc 5160-59)	58B-014183-078	1
-30	O-Ring	74B-010953-232	2
-31	Overload Cap Assy	68B-014671-003	1
-32	Cap, Overload	60B-014670-001	1

IP7_040011

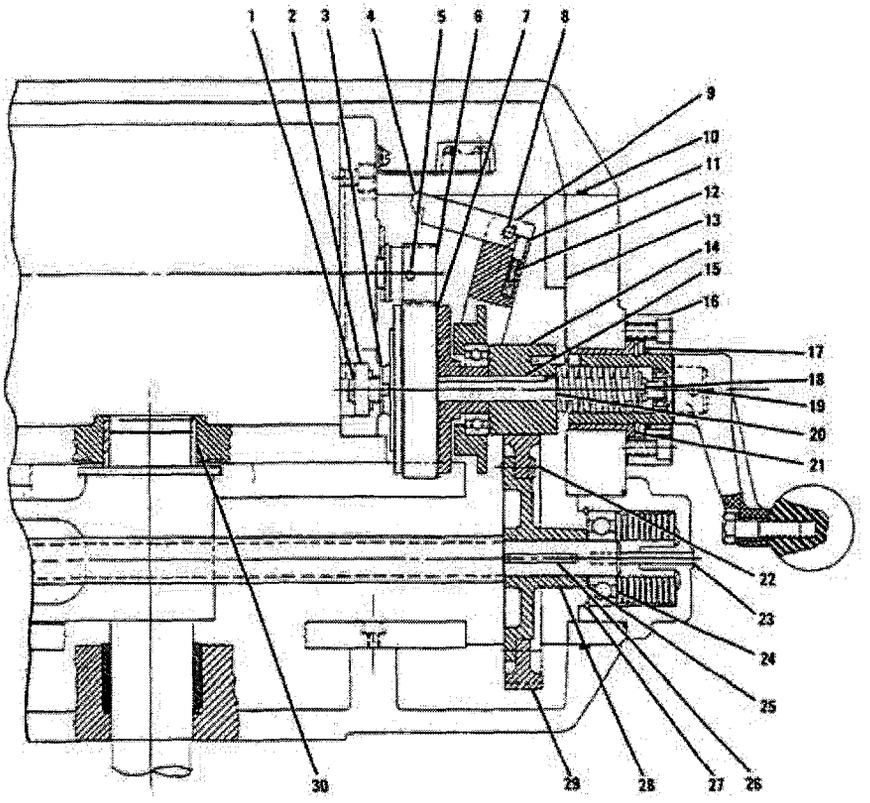


Figure 2

Item	Description	Stock No.	Qty.
2-1	Ring, Retaining	588-014183-050	1
-2	Bearing	178-003813-004	1
-3	Washer, Thrust	568-004107-011	1
-4	Latch, Crank, Manual	61A-015503-001	1
-5	Pin, Roll, 0.125 Dia. x 1.25"	57A-015185-125	1
-6	Key, 3/16 Sq. x 1"	618-010954-332	1
-7	Gear, Fiber	168-003806-019	1
-8	Pin, Clevis	74A-016259-001	1
-9	Pin, Cotter, 3/32 Dia. x 1/2"	COML	1
-10	String, O-Ring, 112.5"	748-010957-995	1
-11	Pin, Latch	61A-011664-001	1
-12	Spring	20A-012337-001	1
-13	Damper, Yoke	61A-012091-001	1
-14	Gear, Slide, 20 sec./30 sec.	68A-016468-001	1
	Gear, Slide, 50 sec.	68A-018566-001	1
-15	Key, 1/8 Sq. x 2.75" 20 sec./30 sec.	618-010954-288	1
	Key, 1/8 Sq. x 2.8" 50 sec.	618-010954-292	1

Item	Description	Stock No.	Qty.
-16	Cap	608-010928-001	1
-17	Washer	61A-013829-001	1
-18	Pin, Cotter, 0.130 Dia. x 3/4"	COML	1
-19	Pin, Roll, 0.25 Dia. x 1.5"	57A-015215-150	1
-20	Shaft, Clutch	62A-015825-001	1
-21	Bearing, Flanged	188-SP1988-056	1
-22	Rivet, Pop	USM-A-610-50	6
-23	Bushing	188-003814-016	1
-24	Bearing	178-003813-003	2
-25	Spacer	13A-014849-003	1
-26	Key, 3/16 Sq. x 1-3/16"	618-010954-338	1
-27	Ring, Retaining	588-014184-206	2
-28	Hub, Gear	608-018548-001	1
-29	Gear, 88T, 16P, 20°PA, 20 sec./30 sec.	16A-013290-001	1
	Gear, 97T, 16P, 20°PA, 50 sec.	16A-017308-001	1
-30	Bearing, Sleeve	188-003814-048	1

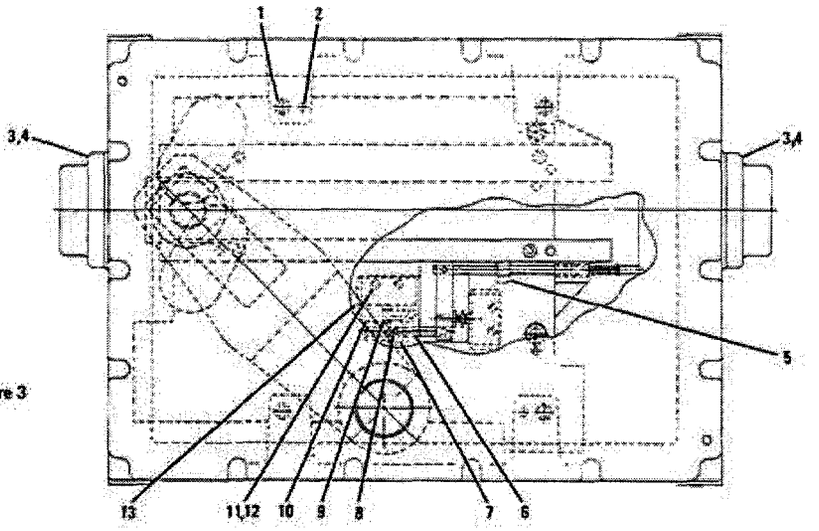


Figure 3

Item	Description	Stock No.	Qty.
3-1	Screw, Cap, Soc Hd, 5/16-18 x 1"	54A-015070-100	4
-2	Pin, Dowel, 0.25 Dia. x 1"	57A-015226-100	6
-3	Screw, Cap, Soc Hd, 5/16-18 x 1-1/4"	54A-015070-125	8
-4	Washer, Lock, 5/16	56A-015221-001	8
-5	Bushing	188-003814-003	1
-6	Shaft, Switch Acutating	62A-014783-001	1
-7	Collar, Switch Actuating	61A-018266-011	1

Item	Description	Stock No.	Qty.
-8	Setscrew, Soc Hd, 10-24 x 0.19"	54A-015047-019	4
-9	Switch, Actuator	14A-009192-001	1
-10	Insulator, Switch	61A-014784-001	2
-11	Screw, Rd Hd, 6-32 x 1-1/4"	54A-015023-125	4
-12	Washer, Lock	56A-015180-001	4
-13	Switch, Limit (SM-5210, SM-5220)	46A-010016-001	2
	Switch, Limit (SM-5260)	46A-010016-003	2

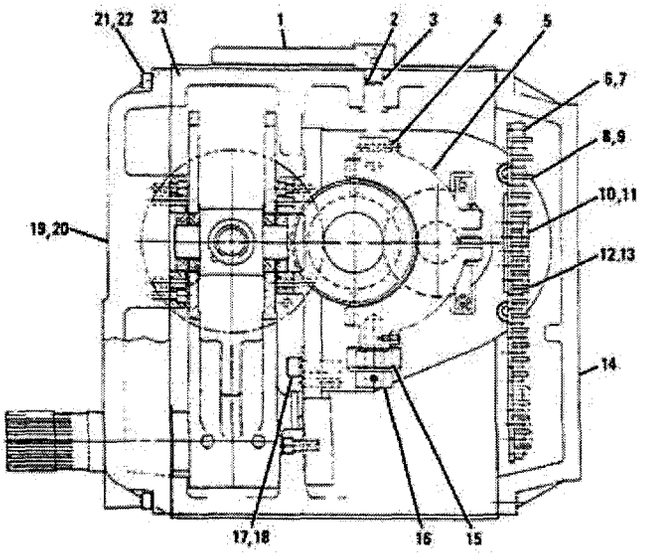


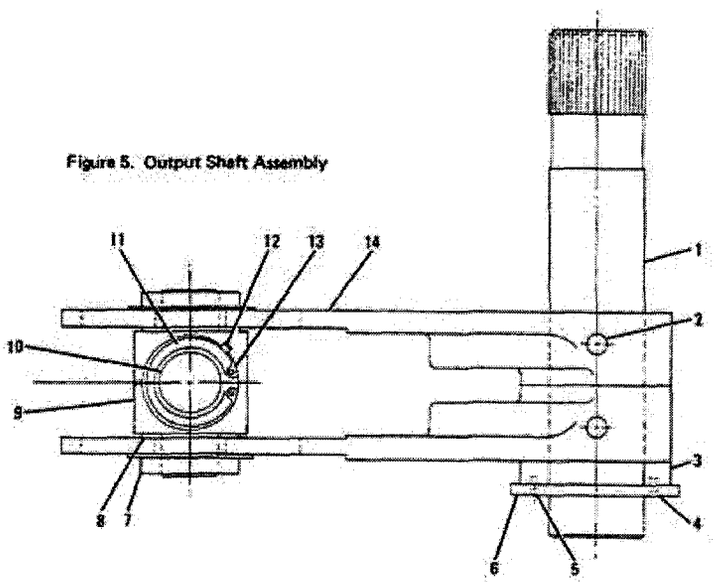
Figure 4

IP7_040013

Item	Description	Stock No.	Qty.
4-1	Lockout Handle Assy.	68A-015493-001	1
-2	O-Ring	74B-010957-012	1
-3	Bearing	18B-SP1988-042	1
-4	Pin, Roll, 3/16 Dia. x 1"	57A-015205-100	1
-5	Yoke Assy	68C-015502-001	1
-6	Screw, Rd Hd, 10-24 x 5/8"	54A-015043-062	4
-7	Washer, Lock	56A-015201-001	4
-8	Strip, Terminal, 4 Pin	43B-003888-504	1
-9	Insulator	32A-014123-004	1
-10	Screw, Rd Hd, 8-32 x 1/2"	54A-015033-050	4
-11	Washer, Lock	56A-015191-001	4
-12	Strip, Terminal, 14 Pin	43B-003888-314	1
-13	Insulator	32A-014123-003	1
-14	Cover, Back, Weathertight	60D-010906-001	1
	Cover, Back, Explosion-proof	60D-010906-003	1

Item	Description	Stock No.	Qty.
-15	Bearing	18B-SP1988-037	1
-16	Collar	74A-012377-002	1
-17	Screw, Soc Hd, 3/8-16 x 1-1/4"	54A-015060-125	2
-18	Washer, Lock	56A-015281-001	2
-19	Front Cover Assy, Weathertight	68B-014130-001	1
	Front Cover Assy, Explosion-proof	68B-014130-003	1
-20	Cover, Front	60D-014061-001	1
-21	Screw, Cap, Soc Hd, 3/8-16 x 1-1/4"	54A-015060-125	38
-22	Washer, Lock	56A-015231-001	36
-23	Housing, Main, Weathertight	60D-012276-001	1
	Housing, Main, Explosion-proof	60D-012276-004	1

Figure 5. Output Shaft Assembly



Item	Description	Stock No.	Qty.
5-	Output Shaft Assy (See Fig. 1-27)	68D-014059-001	1
-1	Shaft, Output, Splined (SM-5210)	62B-014055-001	1
	Shaft, Output, Keyway, (SM-5220, SM-5260)	62B-014056-001	1
-2	Pin, Roll, 3/8 Dia. x 2.05"	57A-015235-250	2
-3	Spacer, Gear	61A-017199-001	1
-4	Screw, Flat Hd 6-32 x 0.5"	54A-015024-050	3
-5	Pin, Roll, 1/8 Dia. x 0.75"	57A-015185-075	2

Item	Description	Stock No.	Qty.
-6	Gear, 144T, 48P	16B-003804-109	1
-7	Bearing	17A-016100-001	2
-8	Bearing	18A-010919-001	2
-9	Carrier, Nut	60C-014384-001	1
-10	Nut, Drive, 1-5 (SM-5210, SM-5220)	14A-010955-002	1
	Nut, Drive, 1-8 (SM-5260)	61A-012784-002	1
-11	Spacer, Drive Nut	74A-014777-001	2
-12	Key, 0.187 Sq. x 2"	61B-010954-364	1
-13	Ring, Retaining (Truarc N5000-138)	58B-014184-138	2
-14	Arm, Pivot	60C-014780-001	2

IP7_040014

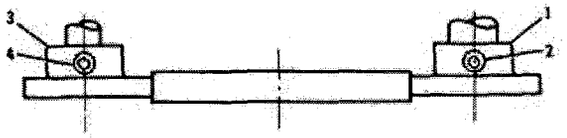


Figure 6. Feedback Gearing

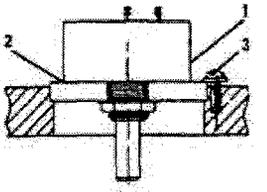


Figure 7. Standard Feedback — Potentiometers

Item	Description	Stock No.	Qty.
6-1	Gear	16A-014020-001	1
-2	Setscrew, 10-24 x 3/16"	54A-015047-019	1
-3	Gear	16B-003803-022	1
-4	Setscrew, 8-32 x 3/16"	54A-015047-019	1

Item	Description	Stock No.	Qty.
7-1	Potentiometer, Precision, One-Turn, 1K	34A-015848-001	1
-2	Disk, Adapter	61A-SM3304-003	1
-3	Screw, Truss Hd, 8-32 x 0.25"	54A-015032-025	2

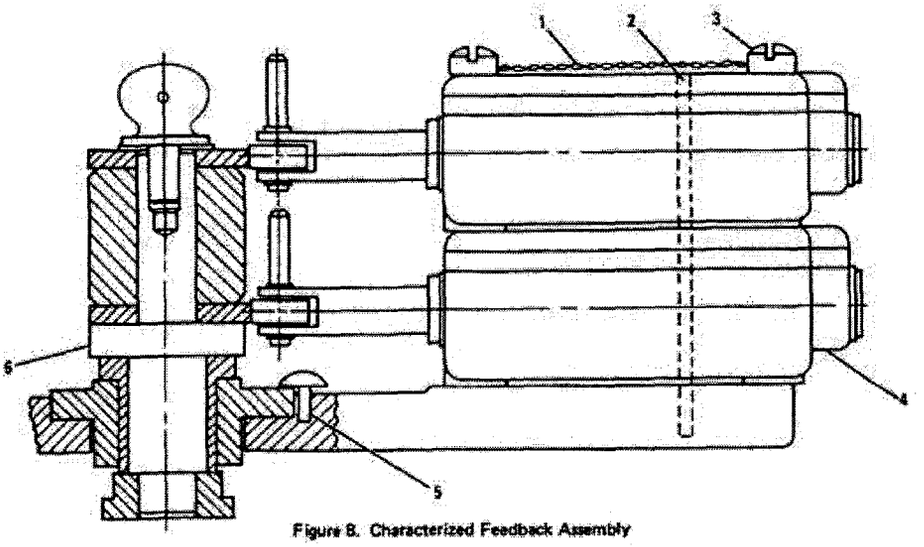
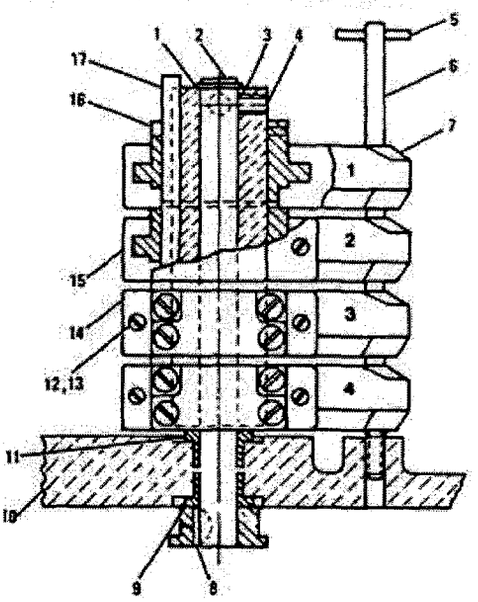


Figure 8. Characterized Feedback Assembly

Item	Description	Stock No.	Qty.
8-	Characterized Feedback Assy	68D-015436	1
-1	Wire, Tie	COML	AR
-2	Pin, Dowel, 0.093 Dia. x 0.31" (single)	57A-015176-031	1
	Pin, Dowel, 0.093 Dia. x 1.38" (tandem)	61A-015525-001	1
-3	Screw, Fil Hd, 10-32 x 1-3/8" (single)	COML	2
	Screw, Fil Hd, 10-32 x 2-3/8" (tandem)	COML	2
-4	Linear Pot Assy (single)	68C-015435-001	1
	Linear Pot Assy (tandem)	68C-015435-002	1
-5	Screw, Truss Hd, 8-32 x 0.25"	54A-015032-025	2
-6	Cam Shaft Assy (single)	68B-015488-001	1
	Cam Shaft Assy (tandem)	68B-015488-002	1

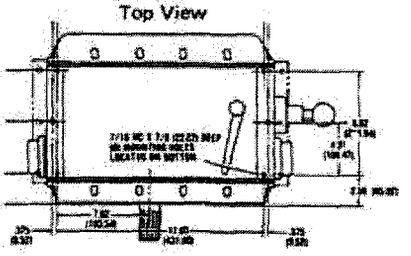
IP7_040015

Figure 9. Heavy Duty Feedback Switch Assembly

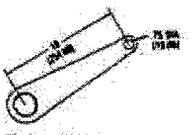


Item	Description	Stock No.	Qty.
9-	Heavy Duty Feedback Switch Assy	68C-014213-1	1
-1	Ring, Retaining (Truarc 5100-50)	58B-014183-050	1
-2	Shaft, Inner	62A-014212-001	1
-3	Shaft, Feedback	62A-014211-001	1
-4	Setscrew, Soc Hd, 1/4-20 x 0.38"	54A-015067-038	1
-5	Pin, Roll, 1/8 Dia. x 1"	57A-015185-100	1
-6	Key, Feedback, Round	61A-014789-001	1
-7	Molding, Feedback Plate	61B-014592-001	4
-8	Key, Woodruff (404)	COML	1
-9	Bushing	18B-SP1988-038	1
-10	Support, Center	60D-014064-001	1
-11	Bushing	18B-SP1988-076	1
-12	Screw, Rd Hd, 6-32 x 0.50"	54A-015023-050	8
-13	Washer, Lock	56A-015180-002	8
-14	Switch, Limit, AC, (Standard)	46A-010017-001	4
	Switch, Limit, DC, (Used with Amp)	46A-010017-003	4
-15	Molding, Cam	14B-012775-001	4
-16	Ring, Retaining (Truarc 5103-125)	58B-017287-125	1
-17	Key, Machining, Feedback	61A-013519-003	1

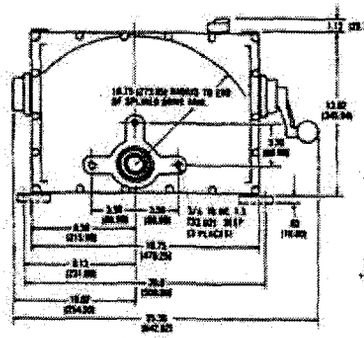
Top View



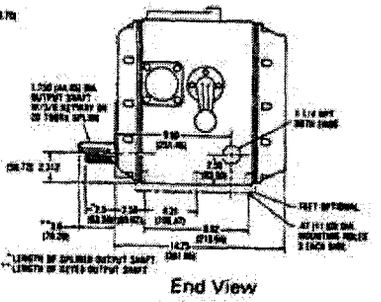
DIMENSIONS



Drive Arm



Side View



End View

Dimensions in parenthesis, [ ] are metric.

INSTALLATION

MOUNTING

The outline and mounting dimensions for a standard unit are shown on page 9 of this brochure. The rear cover opposite the output shaft must have clearance so that it may swing open for adjustments and interconnect wiring. When the actuator is directly coupled to a drive shaft, it is recommended that a flexible no backlash type coupling be used. The output shaft is also available with a splined output for standard lever arms and linkage drive to the driven load. The unit may be mounted on the standard foot mount, or a flange mount. Mounting may be in any position convenient to the driven load. When mounting the unit, be sure that no excessive axial or side loading is applied to the output shaft. The limit switches and position feedback are connected through gearing to the output shaft of the actuator which should be positively secured to the driven load shaft so that no slippage can occur which would cause misalignment or damage.

When manual override is required, as in the event of a power failure, or to initially align and connect linkages, de-energize the motor before starting the manual cranking procedure. The crank is engaged by operating the auto-manual selector lever at the top of the actuator. Facing the crank end of the actuator, with the output shaft to the left, pull the lever toward you until latching occurs. If latching does not occur, turn the crank handle slowly while continuing to operate the lever. Latching will then occur. Release the lever. It will return to the normal position. Normally crank handle rotation of less than 180° will enable engagement.

Hand cranking will now rotate the actuator output shaft to the desired position. CW rotation of the crank will result in CW rotation of the shaft when viewing the shaft-end side of the actuator. If during manual cranking, electric power were to be applied to the actuator, the handcrank will be instantly disengaged and the actuator will respond to the power command. The manual crank cannot be power driven, thereby protecting the operator.

Care should be taken when manually driving a load, to recognize that excessive output torque can be developed through the handcrank. A mechanical telltale-indicator shaft, located in the center of the thrust housing assembly nearest the handcrank, indicates the over-torquing. The telltale shaft will either protrude or recede depending on the direction of over-torquing. Discontinue cranking in that direction on over-torque warning.

The limit switch and feedback area of the actuator depends upon the cover to maintain the NEMA 4 rating. This cover should be removed only when actual work is being done in that area and reinstalled immediately thereafter.

This actuator contains no internal mechanical stops. If it is allowed to run outside of the initial factory alignment of the limit switches, a realignment of switches and feedback might be required. However, no internal damage will have occurred. Refer to page 11 for limit switch adjustment.

MECHANICAL

Mount the actuator per the provisions shown in the installation drawing.

When coupling to a keyway shaft, attach a load coupling device to the shaft using a 3/8 x 3/8 standard key. When a keyed shaft is specified, care should be taken to orient the coupling that will connect the actuator to the driven load. The output shaft of the actuator rotates only 90° and the keyway when in the straight up position with respect to level orientation, represents the 45° position. If the driven load is a butterfly valve or damper, caution should be taken to insure that the limited range of the actuator matches the limited range of the driven load.

ELECTRICAL INTERCONNECT

The wiring diagrams on page 12 show the interconnect wiring connections for typical three phase control, one phase control and the standard DC motor. These drawings show an arrangement with torque switches, limit switches, feedback potentiometer and a heater. To meet special requirements, certain items shown may not be supplied and in that case the terminals will be blank. In all instances the wiring diagram appropriate to the equipment will be supplied with the equipment.

A barrier type terminal strip is located under the rear cover opposite the output shaft. One conduit entry is located at each end of the unit to accommodate standard 1-1/4 inch N.P.T.

CAUTION: Three phase or DC units must have their limit switches and torque switches wired into their controlling device so as to cause end of travel or torque shut down. Care must be taken in wiring these to the controlling device so that the appropriate direction of drive is turned off when that direction's protective switches are actuated. If care is no taken in properly phasing the equipment, damage may occur to the actuator or the driven load.

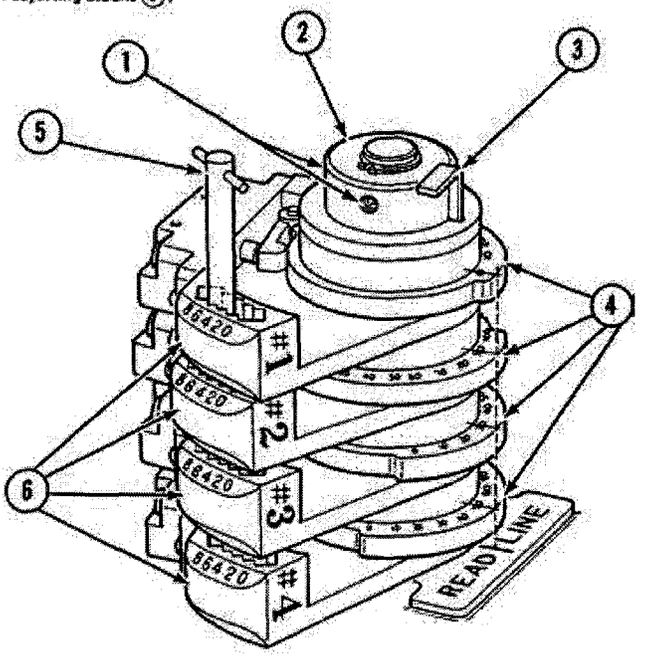
Refer to page 9 for additional electrical information and date.

MAINTENANCE

Under normal service conditions the motor, gearing, bearings and parts are all pre-lubricated and should not require periodic maintenance. If for any reason the unit is disassembled in the field, all oillite bushings should be resaturated with an S.A.E. 30 oil and all gearing heavily coated with an Andok B or equal grease. Care should be taken to insure that no foreign material is allowed to become entrained with the grease in the gear train, which will cause premature failure.

KEY LOCK SWITCH ADJUSTMENT

The key lock limit switch assembly is a method of switch adjustment that after alignment may be adjusted without special tools. Following Steps 1 and 2 are normally factory adjustments. Steps 3 through 9 describe how coarse 10% adjustments are made with cams (4) and fine 2% adjustments are made with adjusting blocks (6).



1. Manually turn the actuator to the full clockwise position, viewing the output shaft.

2. Loosen 2-# ¼-20 set screws (1) in outer shaft (2). Rotate (2) until key (3) lines up with "Read Line". Lock both set screws (1). This is a one time alignment, and the screws must be tight.

3. Pull Key (3) which will release the cams (4). The outer most cam #1 and cam #3 are the clockwise cams. The scale on the cams represent % of travel in increments of 10% with 0 at the clockwise end. Rotate cams 1 and 3 to the nearest 10% increment below the desired CW travel limit. That is if 4% is required, set cam (4) at 0 on the read line.

4. Cam 2 and 4 are the counter clockwise cams. 100% will be at the counter clockwise end. Rotate cams 2 and 4 to the nearest 10% increment below the desired CCW travel limit. That is if 96% is required, set cams at at 90% on the read line.

5. Insert Key (3) to lock cams in place after settings are made. Cams might have to be moved a small amount to line up key with keyway.

6. Unscrew pin (5) until loose and pull completely out of fine adjusting blocks (6).

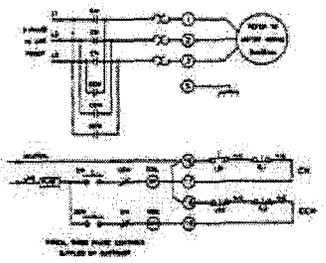
7. The fine adjusting blocks have 5 positions that pin (5) may be placed in. Each position represents a 2% increment within the 10% range on the cam. If 4% is desired at the clockwise end of travel, insert pin (5) in the square hole opposite 4 on the adjusting block (6) on switch 1. Insert pin (5) through the remaining blocks adjusting the desired percentage on each one.

8. As the pin (5) is inserted in the last block, the complete group of blocks should be positioned so that pin (5) may be screwed back in the tapped hole.

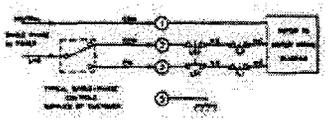
9. Observe the position that the actuator stops at, and if incorrect, note the amount that it is off so that the switches controlling that position may be adjusted that amount. Remember if the shaft requires correction CW move switches to a lower percent of travel. If CCW move switches to a higher setting.

TYPICAL WIRING DIAGRAMS

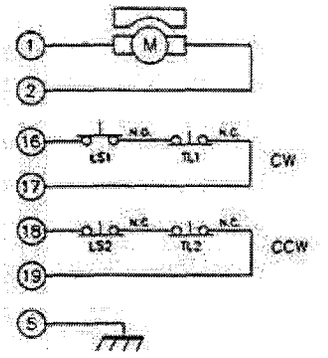
SM-5210



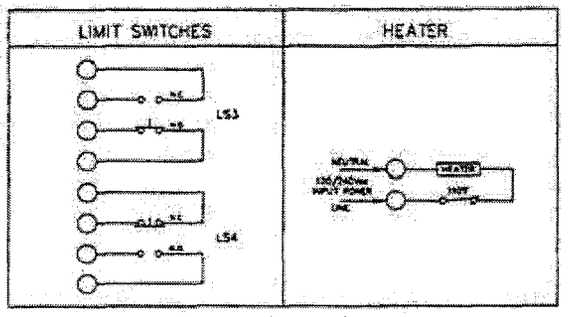
SM-5220



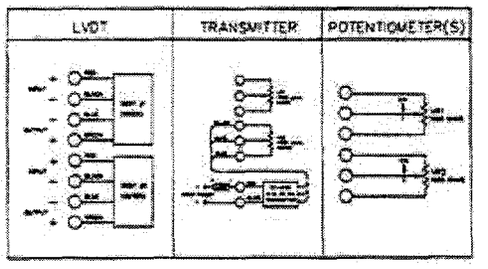
SM-5260



OPTIONS



FEEDBACK DEVICES



Jordan Controls, Inc.

5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Phone: (414) 461-9200
FAX: (414) 461-1024

IM-0464 8/93
Supersedes IM-0464 11/80

Jordan

Jordan Controls, Inc.

Instruction Manual

IM-0607

AD-8100 & AD-8200 Servo Amplifiers

TABLE OF CONTENTS

Due to wide variations in the terminal numbering of actuator products, actual wiring of this device should follow the print supplied with the unit.

GENERAL INFORMATION

INTRODUCTION

Jordan Controls, Inc., designs, manufactures, and tests its products to meet many national and international standards. For these products to operate within their normal specifications, they must be properly installed and maintained. The following instructions must be followed and integrated with your safety program when installing, using, and maintaining Jordan Controls products:

- Read and save all instructions prior to installing, operating, and servicing this product.
- If you do not understand any of the instructions, contact your Jordan Controls representative for clarification.
- Follow all warnings, cautions, and instructions marked on, and supplied with, the product.
- Inform and educate personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in Jordan Controls installation instructions and per applicable local and national codes. Connect all products to the proper electrical sources.
- To ensure proper performance, use qualified personnel to install, operate, update, tune, and maintain the product.
- When replacement parts are required, ensure that the qualified service technician uses replacement parts specified by Jordan Controls. Substitutions may result in fire, electrical shock, other hazards, or improper equipment operation, and will void product warranty.
- Keep all product protective covers in place (except when installing, or when maintenance is being performed by qualified personnel), to prevent electrical shock, personal injury, or damage to the actuator.

WARNING - SHOCK HAZARD

Installation and servicing must be performed only by qualified personnel.

WARNING - ELECTROSTATIC DISCHARGE

This electronic control is static-sensitive. To protect the internal components from damage, never touch the printed circuit cards without using electrostatic discharge (ESD) control procedures.

RECEIVING/INSPECTION

Carefully inspect for shipping damage. Damage to the shipping carton is usually a good indication that it has received rough handling. Report all damage immediately to the freight carrier and Jordan Controls, Inc.

Unpack the product and information packet—taking care to save the shipping carton and any packing material should return be necessary. Verify that the items on the packing list or bill of lading agree with your own.

STORAGE

If the product will not be installed immediately, it should be stored in a clean, dry area where the ambient temperature is not less than -20° F, and is a non-corrosive environment.

EQUIPMENT RETURN

A Returned Goods authorization (RG) number is required to return any equipment for repair. This must be obtained from the Jordan Controls Service Department. (Telephone: 414/461-9200) The equipment must be shipped, freight prepaid, to the following address after the RG number is issued:

Jordan Controls, Inc.
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Attn: Service Department

To facilitate quick return and handling of your equipment, include:
RG Number on outside of box
Your Company Name, Contact Person, Phone/Fax number
Address
Repair Purchase Order Number
Brief description of the problem

ABBREVIATIONS USED IN THIS MANUAL

AC	Alternating Current
DC	Direct Current
DIP	Dual Inline Package (switch)
Hz	Hertz
LED	Light Emitting Diode
LOS	Loss of Signal
mA	Milliamp
NC	No Connection
RG	Return of Goods
Vac	Volts ac
Vdc	*Volts dc*

GENERAL DESCRIPTION

The AD-8000 series of servo amplifiers are on/off triac output AC servo amplifiers suitable for operating a variety of Jordan Controls actuators. Standard features include on-board switch selectable command input for 0-5 Vdc, 0-10 Vdc, or 4-20mA; selectable loss of command signal operation; 4-20mA isolated output transmitter tracking actuator shaft position; dynamic motor braking; 120 or 240 Vac, 50/60 Hz. input power depending on actuator motor being used; and on-board LED's and adjustment pots for ease of set-up. The customer's command signal is isolated from both the ac line and the electric motor in the actuator.

In addition, the AD-8230 servo amplifiers features an isolated, "null" output for customer use. The amplifier will output line voltage AC, or half wave DC, when the actuator is stopped, or when running - selectable by the customer.

BASIC MODELS

AD-8130: For integral installation on all Jordan AC powered 1100, 1700, 2400 and 5100 Series actuators

AD-8130/EC-10835: For direct replacement of AD-8850 and AD-8860

AD-8230: For integral installation on all Jordan AC powered 1500, 1600 and 3330 Series actuators

AD-8230/EC-10836: For new installations requiring remote servo amplifier installation or for direct replacement of existing AD-8813, AD-8823, AD-8833 and AD-8843 series amplifiers. Also used as an integral amplifier with Jordan SM-5220 actuator.

AD-8230/EC-10842: For replacement of all AD-8210 and AD-8220 Series amplifiers. (Same as AD-8230, except with a wire harness and molex connectors)

SPECIFICATIONS

POWER:
Voltage Input: 120 or 240 Vac, 50 or 60 Hz, single phase
(Voltage input must match actuator motor voltage rating)
Power Consumption: less than 20 watts for amplifier functions only
Voltage Output: identical to voltage input
Current output: 10 amps maximum at 120 or 240 Vac
Fuse protection: customer supplied. Size based on actuator controlled, and local codes
Null output (AD-8230): rated 2 amperes @ 120 or 240 Vac, 50 or 60 Hz

COMMAND SIGNAL INPUTS, FIELD SELECTABLE:
4-20mA current command into a 200 ohm impedance
0 to 5 or 0 to10 vdc voltage command into a 100,000 ohm impedance
1000 ohm potentiometer command is an option on the AD-8230/EC-10836 model only

POSITION FEEDBACK SIGNAL:
1000 ohm potentiometer
4 to 20mA (optional on AD-8230/EC-10836 models only)

POSITION SIGNAL OUTPUT: Isolated, 2 wire, 4 to 20mA signal

APPROXIMATE WEIGHTS:
AD-8130, AD-8230 & AD-8230/EC-10842 - 2 lbs. (0.9 kg)
AD-8130/EC-10835 & AD-8230/EC-10836 - 4 lbs. (2 kg)
with enclosure "E" - 25 lbs. (11 kg)
with enclosure "X" - 40 lbs. (18 kg)

INSTALLATION WIRING

Most installations locate the servo amplifier inside a Jordan actuator, for ease of mounting and to protect the amplifier. This is the preferred mounting arrangement. For remote mounting, the servo amplifier and actuator should be as close to each other as possible.

Ensure all connections are correct and tight before applying power. Power, command signal, feedback signal, and motor output are the minimum required connections. To connect optional features for electromagnetic brake control or optional indicator lights, refer to the wiring diagram for the specific amplifier and actuator.

- All wiring should be done in accordance with prevailing codes by qualified personnel.
- Typical wiring diagrams are shown on pages 8 thru 12. **Actual wiring should follow the print supplied with the actuator.**
- Fusing must be installed in line power, and should be of the slow blow type.
- After installation, it is recommended that all conduits be sealed to prevent water damage.
- All low level signal wiring should be a shielded type with the shield grounded at source common.

SET-UP & CALIBRATION

When placing the amplifier and actuator into service, the amplifier must be calibrated for the application. The servo amplifier is supplied factory calibrated when ordered with a Jordan Actuator and should require only minor adjustment.

Read and follow the instructions carefully before attempting to make adjustments to the servo amplifier.

1. First, be sure that the line power to the actuator matches the actuator nameplate. Improper input voltage will cause the actuator to misperform. The amplifier voltage selector switch must be in the correct position for the motor voltage being used. Refer to the actuator nameplate for correct voltage to apply. **Operating voltage changes cannot be made simply by changing the position of the amplifier voltage switch.**
2. Check connections. POWER SHOULD BE OFF. Check that the amplifier is properly mounted, that all connections to the actuator are in accordance with the correct Jordan Controls wiring diagram, and that the unit is properly grounded in accordance with all prevailing Electric Codes. Incorrect wiring may cause permanent damage to the servo amplifier and actuator. Verify that the command signal is connected to the proper terminals. Using a voltmeter, confirm that the command signal is present and properly polarized.

   Dynamic braking is standard on this amplifier and, when used, reduces coasting and improves positioning accuracy by applying a braking action to the motor during stopping. Dynamic braking must be selected "on" or "off" prior to making any amplifier adjustments. The dynamic brake functions by energizing both motor windings for a fraction of a second. Select either "on" or "off" using the appropriate DIP switches.
3. Verify DIP switch settings. Refer to the DIP switch location and table on pages 5 and 6 for the specific amplifier being adjusted. Confirm that the switches are properly set for the intended application. For special applications not listed, consult factory. Incorrect DIP SWITCH settings will prevent proper operation. Check position of the null output jumper P1 and verify that it is in the correct position.
4. NOW APPLY POWER.
5. Set **HI TRIM** and **LO TRIM**. Apply command signal at minimum input value. For 4-20mA systems this would normally be 4mA. Adjust pot labeled **LO TRIM** to move actuator position to correspond with minimum desired position without actuating the end-of-travel limit switch. Next apply command signal at maximum input value. For 4-20mA systems this would normally be 20mA. Adjust pot labeled **HI TRIM** to move actuator position to correspond with maximum desired position without actuating the end-of-travel limit switch. Some interaction of the above pot settings will require repeating this procedure until proper accuracy is achieved.
6. Set **DEADBAND**. Deadband prevents unstable operation, or "hunting". The deadband pot is torque sealed at the factory at 0.1% of the control signal span, and this setting will normally be satisfactory. Should the deadband need to be increased, counterclockwise rotation of the **DEADBAND** pot will increase the deadband, preventing "hunting". Clockwise rotation of the pot will decrease the deadband. **The correct setting is the point where no "hunting" is observed AND when both the green and yellow LED's go out when the actuator stops.**

   CAUTION: The deadband must NEVER be adjusted to allow both the yellow and green LED's to be on at the same time. This will result in dangerous overheating and burnout.
7. Loss of signal. In the event of a loss of command signal ("LOS"), the servo amplifier can be programmed to either lock in place or go to a customer adjusted preset position. Loss of signal feature is only available when using 4-20mA command signal. This feature is normally factory supplied in the lock-in-place selection. A signal level below 3mA results in a loss of signal detection by the servo-amplifier. Refer to the DIP SWITCH chart on pages 5 and 6 to select desired operation. Then, with the servo amplifier in normal operation, apply a command signal below the minimum 3 mA position. If lock-in-place is selected the actuator should stop and the red LOS LED should light. If "move to preset" is selected, rotate the LOS pot until the actuator moves to the desired position and stops. Reapply and then remove the command signal several times to verify correct operation.
8. Loop powered 4-20mA transmitter. This amplifier is equipped with an on-board two wire transmitter that transmits the true actuator output shaft position and requires an external 12 to 36 Vdc power supply. Adjustment is as follows: Apply a command signal to the actuator at the minimum value. For 4-20mA systems this would normally be 4mA. After the actuator moves to position and stops, adjust the pot labeled **4mA** until the indicator displays 4mA. Then apply a 20mA command signal and wait for the actuator to move and stop. Then adjust the pot labeled **20mA** until the indicator displays 20mA. Repeat this procedure until the desired accuracy is achieved.
9. Switched null output:The AD-8230 is equipped with a TRIAC that will switch line voltage to a customer available connection. This feature may be used to operate a brake in the actuator or to light remote indicating lights. If used for an internal electromagnetic brake, proper adjustment and set-up was performed at the factory. For remote indicating lights, this feature can be configured for either AC or DC output, and to be ON when either the motor is running or when it is idle. A jumper on the printed circuit board indicates the output as AC or DC. Refer to the DIP SWITCH chart to select the output as either ON when the actuator is running, or ON when it is idle.

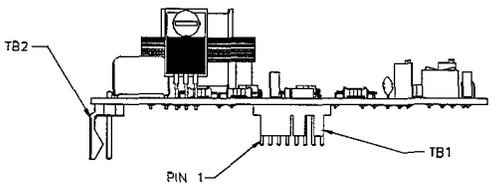
AD-8130
SET-UP AND CALIBRATION

SW2 DIP SWITCH TABLE

SWITCH	POSITION	FUNCTION
1	ON	0-5 VDC OR 4-20mA COMMAND INPUT
	OFF	0-10 VDC VOLTAGE COMMAND INPUT
2	ON	0-10 VDC OR 4-20mA COMMAND INPUT
	OFF	0-5 VDC VOLTAGE COMMAND INPUT
3	ON	LOSS OF SIGNAL - OFF
	OFF	LOSS OF SIGNAL - ON
4	ON	MOVE TO PRESET POSITION ON LOSS OF SIGNAL
	OFF	DO NOT MOVE TO PRESET ON LOSS OF SIGNAL
5	ON	LOCK IN PLACE ON LOSS OF SIGNAL
	OFF	DO NOT LOCK IN PLACE ON LOSS OF SIGNAL
6	ON	DYNAMIC BRAKE ON
	OFF	DYNAMIC BRAKE OFF
7	ON	0-5 OR 0-10 VOLTAGE COMMAND INPUT
	OFF	4-20mA COMMAND INPUT

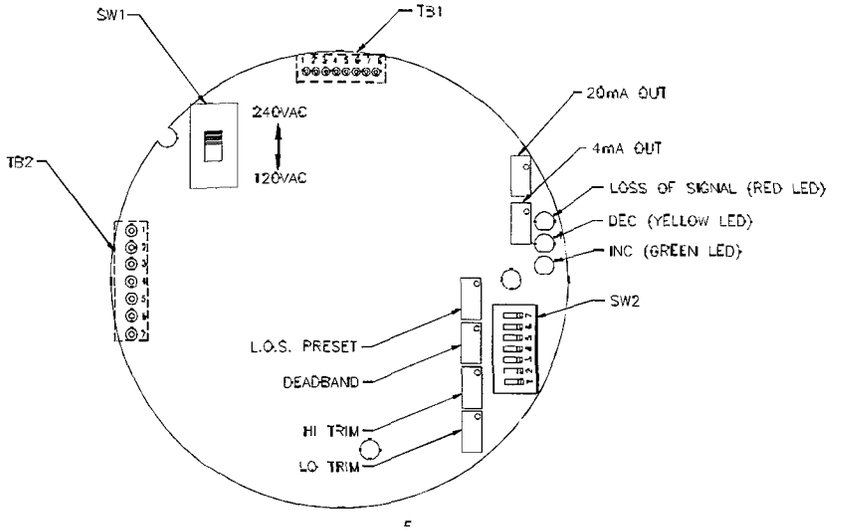
NOTE: When using loss of signal, if DIP switches 4 and 5 are in their on position, the loss of signal action will be lock in place.

COMPONENT SIDE



NOTE: When retrofitting the AD-8130 to replace models AD-8110 or AD-8120, note that the actuator mating connector for TB1 is a 6 pin connector that should engage pins 1 through 6 only. Pins 7 and 8 are 4-20mA outputs for new installations and are not used for replacements. (Note location of pin 1 on above drawing; pins are numbered left to right.) Contact factory if your connectors are located on the component side of the board.

COMPONENT LOCATION
(Looking at component side of board)



AD-8230
SET-UP AND CALIBRATION

SW1 DIP SWITCH TABLE

SWITCH	POSITION	FUNCTION
1	ON	0-5 VDC OR 4-20mA COMMAND INPUT
	OFF	0-10 VDC VOLTAGE COMMAND INPUT
2	ON	0-10 VDC OR 4-20mA COMMAND INPUT
	OFF	0-5 VDC VOLTAGE COMMAND INPUT
3	ON	LOSS OF SIGNAL - OFF
	OFF	LOSS OF SIGNAL - ON
4	ON	MOVE TO PRESET ON LOSS OF SIGNAL
	OFF	DO NOT MOVE TO PRESET ON LOSS OF SIGNAL
5	ON	LOCK IN PLACE ON LOSS OF SIGNAL
	OFF	DO NOT LOCK IN PLACE ON LOSS OF SIGNAL
6	ON	DYNAMIC BRAKE ON
	OFF	DYNAMIC BRAKE OFF
7	ON	0-5 OR 0-10 VOLTAGE COMMAND INPUT
	OFF	4-20mA COMMAND INPUT
8	ON	NULL OUTPUT IS ON WHEN MOTOR IS RUNNING
	OFF*	NULL OUTPUT IS ON WHEN MOTOR IS IDLE
9	ON*	NULL OUTPUT IS ON WHEN MOTOR IS IDLE
	OFF	NULL OUTPUT IS ON WHEN MOTOR IS RUNNING

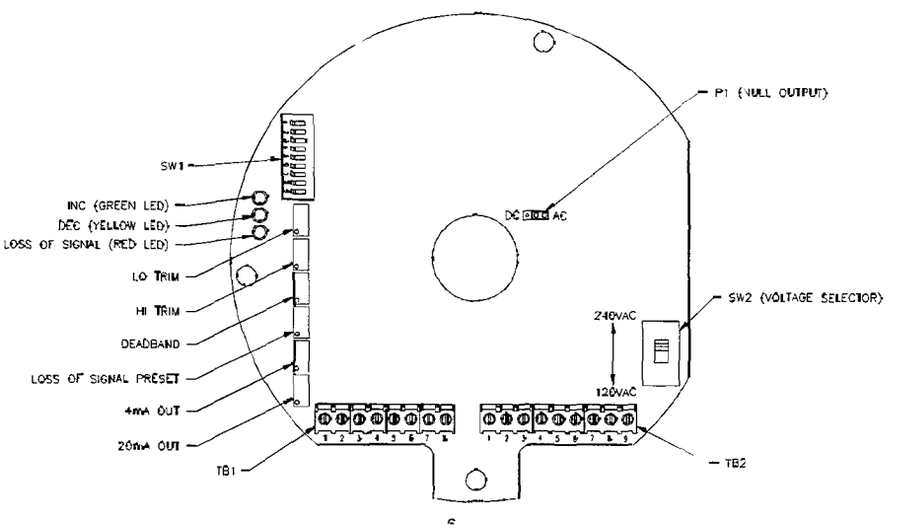
*Must be in these positions when used with 3330 model actuators.

ON-BOARD JUMPER SETTING CONTROLS NULL OUTPUT ONLY

JUMPER POSITION	NULL OUTPUT RESULT
AC*	LINE VOLTAGE
DC	HALF WAVE dc

*Must be in ac position when used with 3330 model series actuator equipped with EC-10678 Brake Module.

COMPONENT LOCATION
(Looking at component side of board)



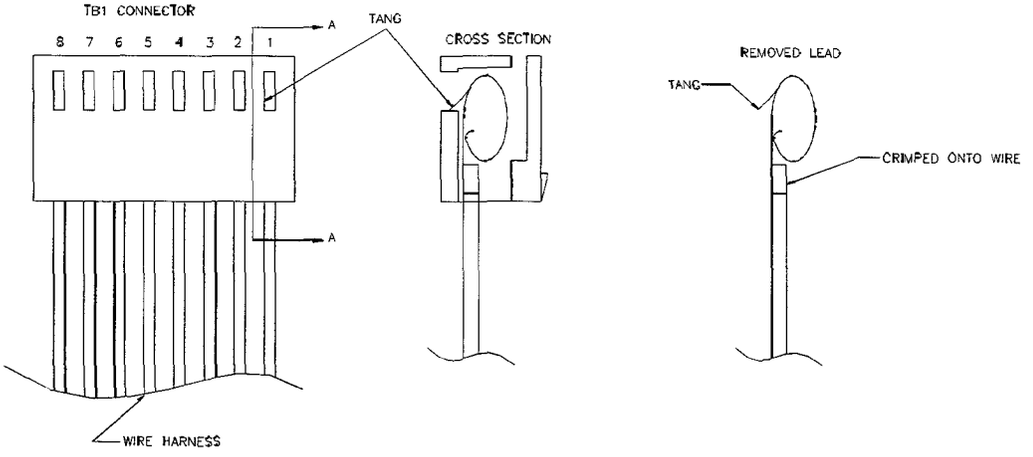
IP7_040025

TROUBLESHOOTING GUIDE

TROUBLE	POSSIBLE CAUSE	REMEDY
1. Motor does not operate	a) No power to amplifier b) Amplifier is in Loss-of-Signal (LED3 is on) c) Amplifier deadband is too wide d) Actuator is wired incorrectly e) Amplifier is defective	a) Restore power b) Check command signal c) Reduce deadband setting d) Correct per wiring diagram e) Replace with new amplifier
2. Motor moves in only one direction	a) Motor and feedback potentiometer are out of phase or no control b) Amplifier is defective	a) For AD-8130, reverse potentiometer leads at TB1-4 & 6 molex connector (see illustration below); for AD-8230 reverse potentiometer leads at TB1-4 & 6 terminal strip b) Replace with new amplifier
3. LED's stay on around null or at null	a) Deadband is too narrow b) Command signal is too noisy	a) Increase deadband settings b) Shield command signal wires

AD-8130 MOLEX CONNECTOR

(Shown larger than actual)

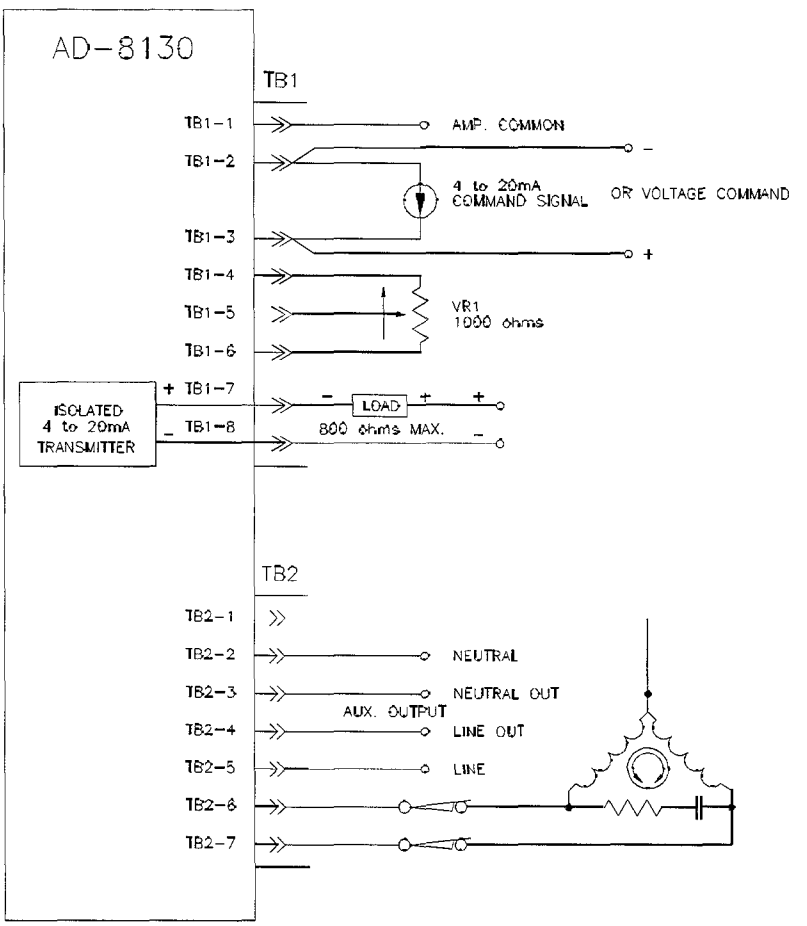


Procedure to change leads in molex connectors (AD-8130 only).

1. With a small screwdriver, depress tang in the small rectangular opening on the connector, and gently remove wires corresponding to pins 4 and 6. Note wire colors so they can be reversed in step 3.
2. Gently bend the tangs outward with a small screwdriver or knife blade to ensure they will lock tightly when reinserted into the connector block.
3. Reverse lead wire color from original location and reinsert back into the connector block.

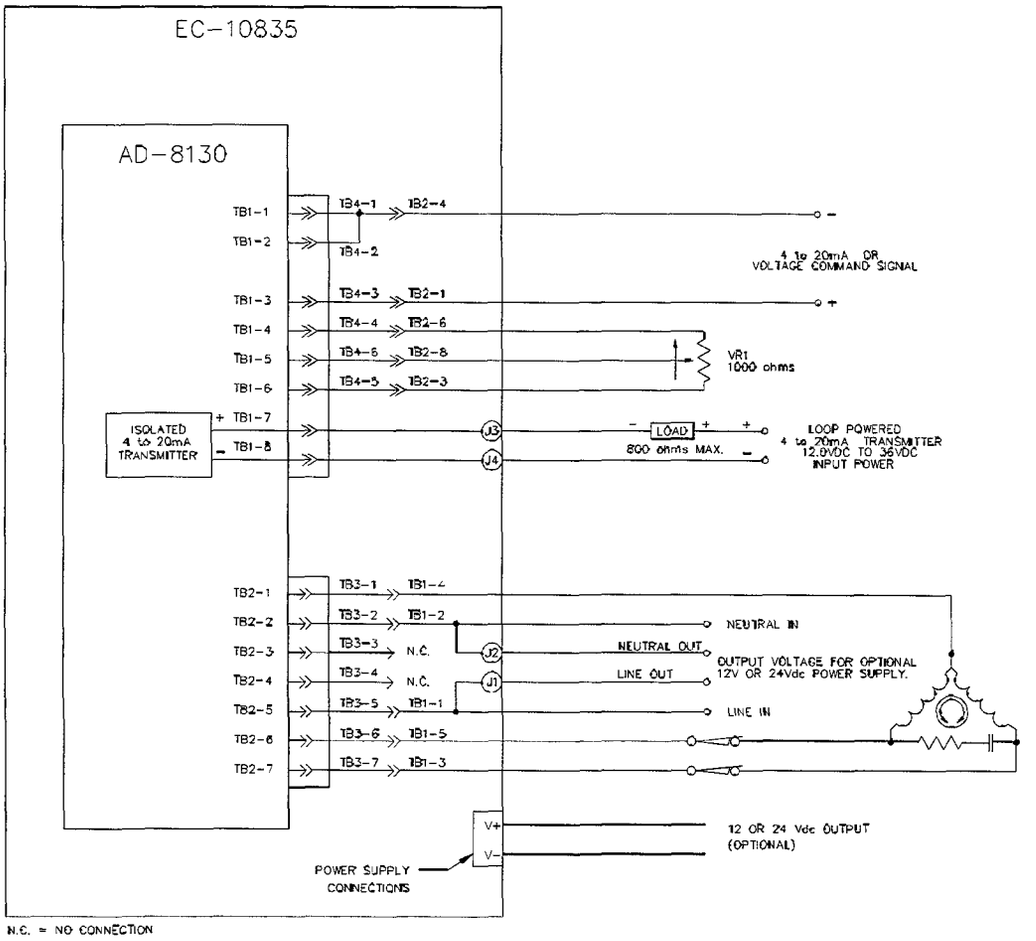
TYPICAL WIRING DIAGRAMS

AD-8130 INTERCONNECT WIRING



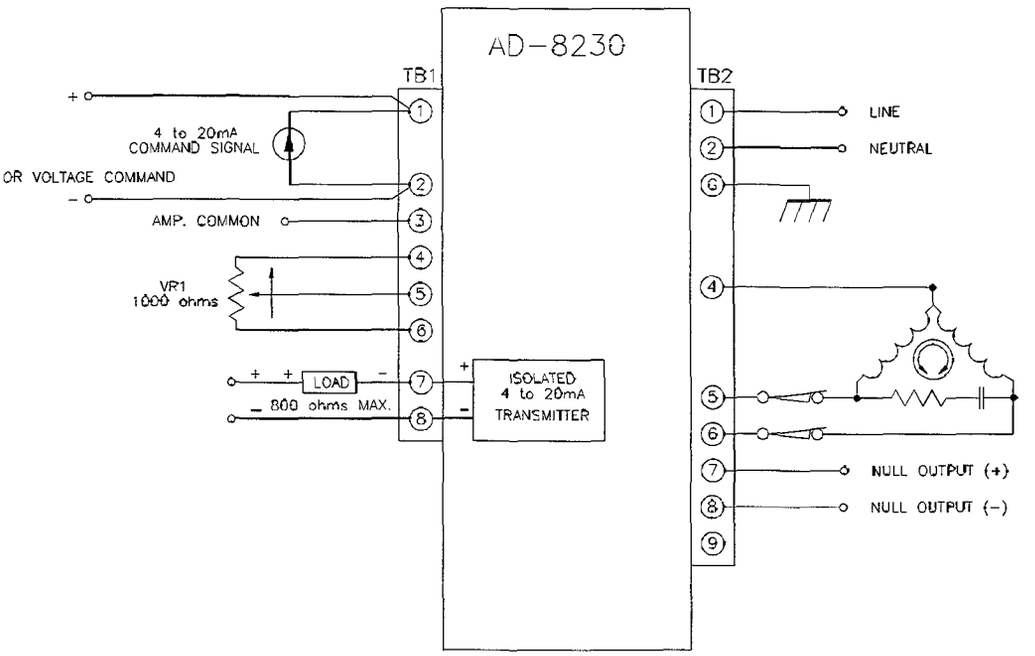
TYPICAL WIRING DIAGRAM

AD-8130/EC-10835 INTERCONNECT WIRING (REPLACEMENT FOR AD-8850 AND AD-8860)



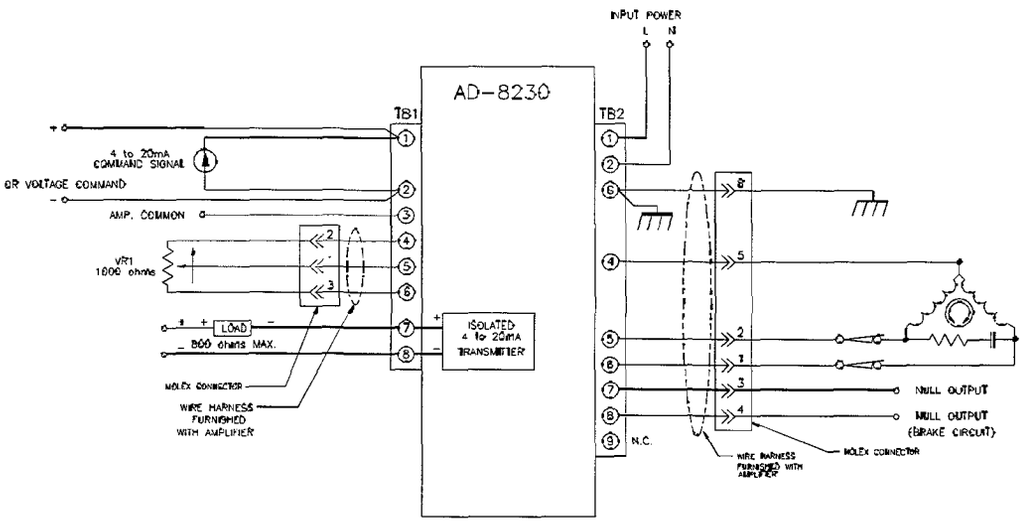
TYPICAL WIRING DIAGRAM

AD-8230 INTERCONNECT WIRING



TYPICAL WIRING DIAGRAM

AD-8230/EC-10842
(REPLACEMENT FOR AD-8210, AD-8220 AND AD-8210-1001)



NOTE: When replacing AD-8210 or AD-8220 with this amplifier, remove and relocate field wiring as follows:

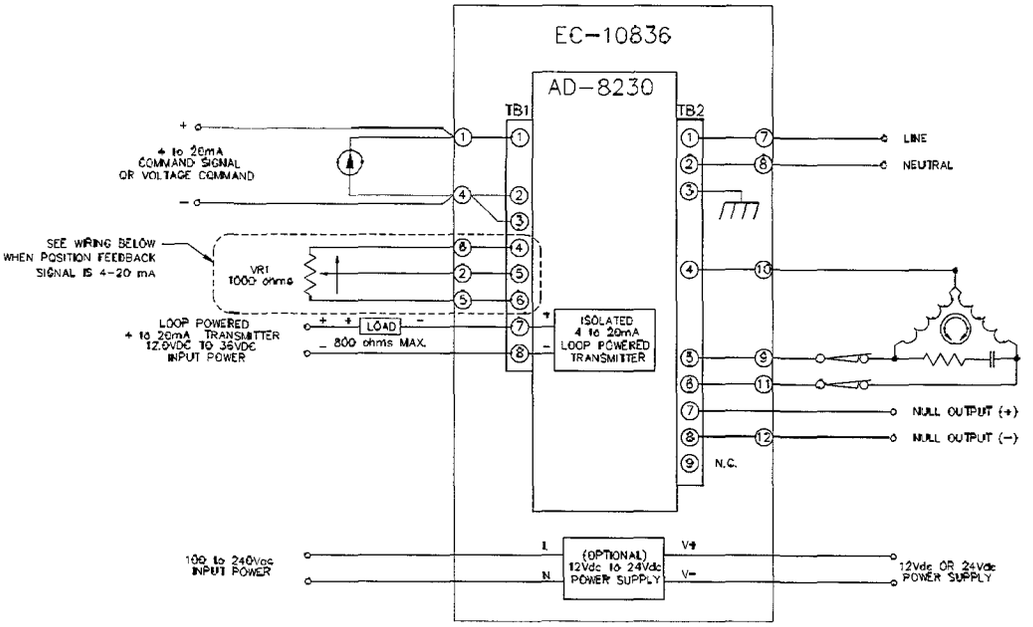
AD-8210/AD-8220 TERMINAL	AD-8230 TERMINAL
1*	Move to TB1-8
3*	Move to TB1-7
4	Move to TB1-2
5	Move to TB1-1
6	None**
7	Move to TB2-3
8	Move to TB2-2
9	Move to TB2-1

*These terminals will only have field wiring when 4 to 20mA position feedback signal transmitter (ST-4130) is used.

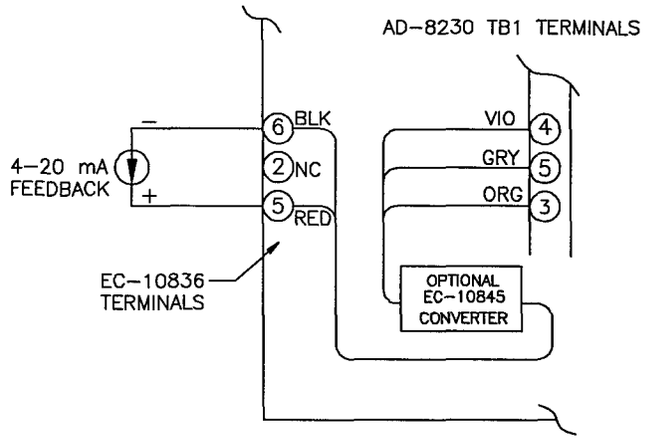
**Command signal ground shield should be grounded at source common and left "floating" at AD-8230.

TYPICAL WIRING DIAGRAMS

AD-8230/EC-10836
(REPLACEMENT FOR AD-8813, AD-8823, AD-8833 AND AD-8843)
(Also used as an integral amplifier in Jordan model SM-5220 actuators)

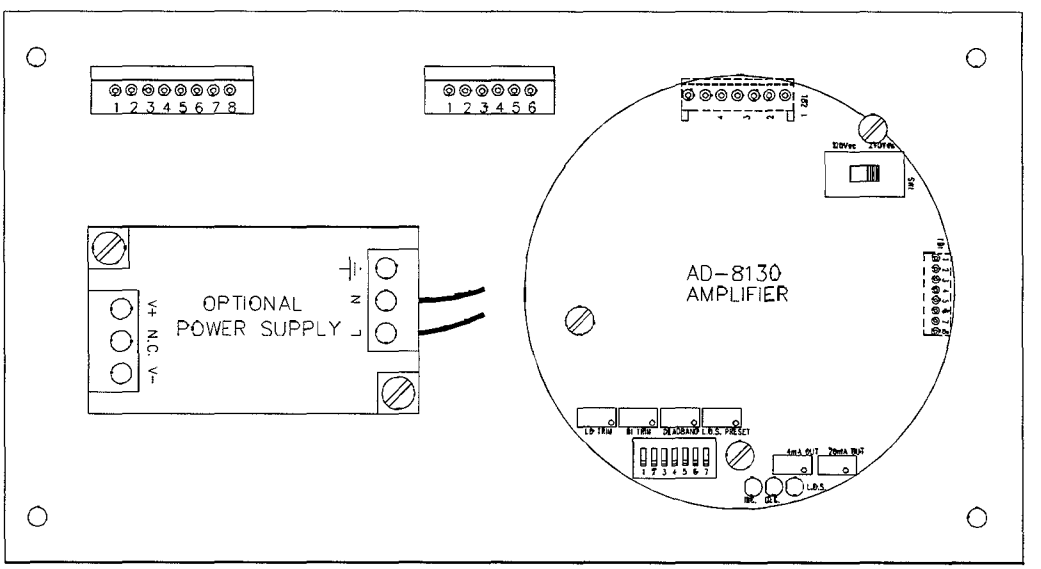


4 to 20mA POSITION FEEDBACK SIGNAL

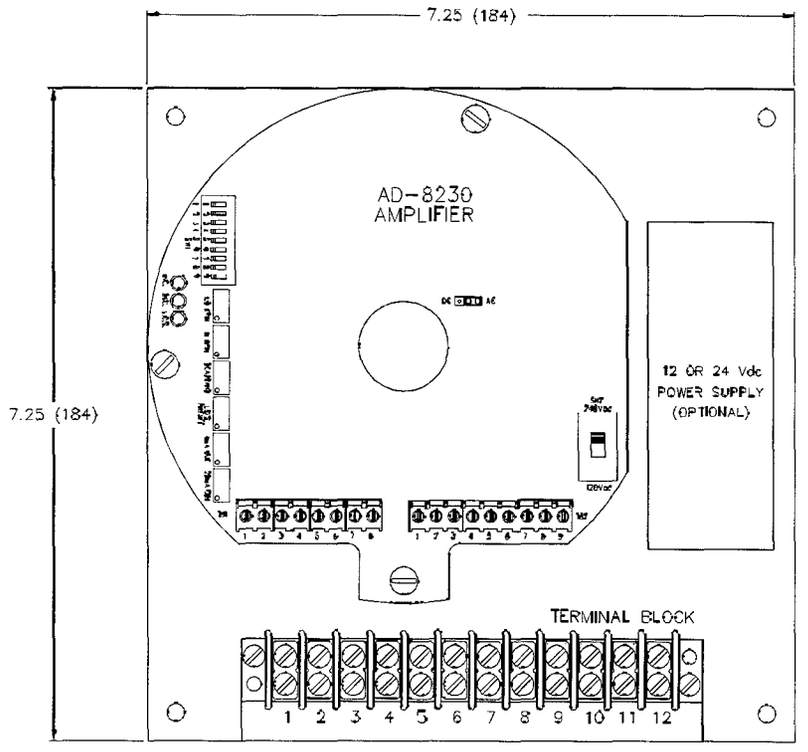


NOTE: The above diagram illustrates 4 to 20mA position feedback signal with customer supplied loop power. An optional 24 Vdc loop power supply is also available from Jordan. Refer to the wiring diagram furnished with the actuator for special calibration instructions when 4 to 20mA feedback is furnished.

AD-8130/EC-10835 PHYSICAL LAYOUT



AD-8230/EC-10836 PHYSICAL LAYOUT

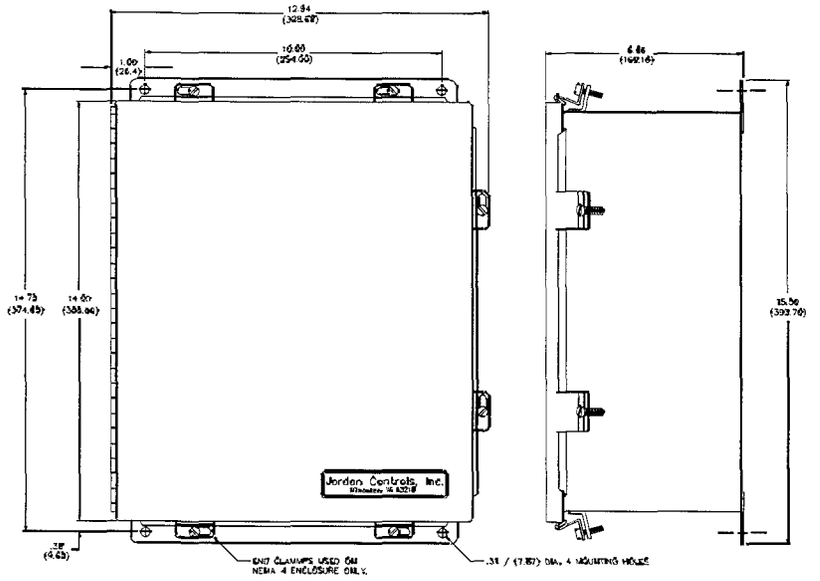


DIMENSIONS = INCHES (MILLIMETERS)

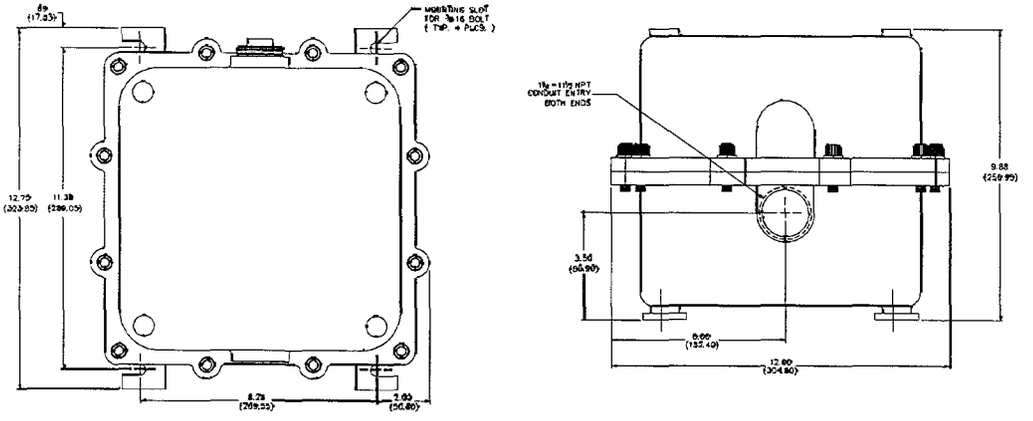
MAJOR DIMENSIONS

AD-8230/EC-10836 INSTALLED IN REMOTE ENCLOSURE

NEMA 4



NEMA 7 & 9



JORDAN CONTROLS, INC.
5607 West Douglas Avenue
Milwaukee, Wisconsin 53218
Phone: (414) 461-9200
FAX: (414) 461-1024
E-Mail: jordan@jordancontrols.com
IM-0607 6/97

These dimensions are subject to change without notice and should not be used for preparation of drawings or fabrication of installation mounting. Current installation dimension drawings are available upon request.

Jordan CONTROLS

From: Ken Nielson
To: Ken Nielson
Date: 1/14/2003 11:25 AM
Subject: Info on possible OFA results

Full Load Conditions:

Steam Flow	6,750,000 lbs/hr
Steam Throttle Pressure	2400 psig
SH Steam Temperature	1005 F
Mills in Operation	7
Fuel Flow	< 385 tons/hr
Excess Air	13.5 - 18.0%
Percent OFA	15%

Expected NOx = 0.34 lbs/mmBTU
Expected CO = 75 ppm

From Specification, Section F2 -
1 General: The scope of this contract includes the design, procurement, fabrication, delivery, installation and start-up of modifications to the Intermountain Generating Station (IGS) Units 1 & 2 Steam Generators.

a. These contract modifications shall provide for a continuous boiler rating of 6,900,000 lbs/hr output at 1005°F superheat and 1005°F reheat temperature under normal operating conditions. These modifications shall also include an overfire air system capable of providing a reduction in NOx emissions of 15% and consistent NOx emissions of less than 0.40 lbs/MMBTU under all operating modes. See Performance Guarantees, Section 12.

2.c. Overfire Air System: The Contractor shall design, fabricate and install an overfire air system on both Units 1 & 2., that is capable of reducing overall NOx by 15% on each unit and allow for operation at or below 0.40 lbs/MMBTU NOx under normal operation. See Performance Guarantees, Section 12.

12. Performance Guarantees: Significant weight will be applied to the form and type of the performance guarantees offered within each bid. Of particular interest to IPSC are the performance parameters associated with operation at 950 Megawatts gross generation (6.75 MMlbs/hr steam flow). These include:

a. Total NOx output of 0.40 lbs/MMBTU or less and an overall reduction of 15%. Current maximum average of 0.45 lbs/MMBTU.

b. Superheat and reheat temperatures as well as NOx emissions must remain within the contract stated acceptable ranges throughout the test.

c. Impact on average unburned carbon (LOIs) and carbon monoxide (CO) concentrations within the boiler.

d. The above operational guarantees shall be verified in a steady state operational test within 30 days of installation. Steady state operation shall be defined as stable and reliable operation at and within the following operating conditions and ranges for a period of at least 7 days:

-7 pulverizers in service (E and G Pulverizers alternately out-of-service).
-Excess air to be controlled between 2.5 to 3.2%.
-Superheat and convection surfaces maintained at 80-85% cleanliness
-Boiler tube maximum allowable metal temperatures must not be exceeded.
-Turbine throttle pressure of 2375 psi.
-Furnace cleanliness maintained at 85-90% actual cleanliness.

-Superheat attemperator spray flow at or above 50,000lbs/hr
-Reheat attemperator spray flow at 0 lbs/hr

From: <fpalacios@babcockpower.com>
To: <KENNETH-N@ipsc.com>
CC: <jgielda@babcockpower.com>
Date: 2/3/2004 2:35 PM
Subject: Instrument Installation-100221
Attachments: Installation-dwgs-zip.ZIP

Ken:
Attached are two zipped drawings showing the tubing of the Magnehelic gauges with compressed air connection as well as an instrukment location drawings. All fittings, valves, little brackets and channels to mount the gauges, filters and flexible SS hoses are purchased in Worcester and shipped to the field for installation by TEI. Notice that there is only one coalescent filter per CAMS as recommended by Air Monitor. If you have any questions please let me know.

(See attached file: Installation-dwgs-zip.ZIP)

Francisco Palacios
Tel (508) 854 4022 Fax (508) 852-7548 or 7558
RILEY POWER, Inc.
(was DB Riley, Inc) 5 Neponset Street
PO Box 15040, Worcester, MA 01615-0040
email: Fpalacios@babcockpower.com

From: <fpalacios@bbpwr.com>
To: <KENNETH-N@ipsc.com>
CC: <csimmons@bbpwr.com>, <ddorman@bbpwr.com>, <lboucher@bbpwr.com>
Date: 2/10/2003 2:38 PM
Subject: Instrument location drawing 100210-7-4909-10-00
Attachments: 100210-7490910-00.dwg

Ken:
I am transmitting the attached Instrument Location drawing for your information. If should have any questions, please let me know.
Francisco

(See attached file: 100210-7490910-00.dwg)

From: Ken Nielson
To: Bill Morgan; Jerry Hintze
CC: James Nelson
Date: 1/13/2003 10:17 AM
Subject: Intermountain Generating Station
Attachments: IGS01-02 OFA Controls Summary.doc

Attached is the summary description of the OFA system and OFA controls strategy per request from the Environmental group. Please let know if modification is required or if additional detail is required.
Thanks,
Ken N.

From: Ken Nielson
To: fpalacios@babcockpower.com
Date: 1/21/2004 12:19 PM
Subject: Intermountain Power - Access Hatch sketches.
Attachments: OFA port volu-probe access hatch.pdf

Francisco,
Attached is the sketch used for field construction of the access hatches to the individual OFA port volu-probes. These were constructed at 10", but if you wan to increase them to 12" to allow easier tool access in the future, that would be great.

Thanks,
Ken N.

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
Phone: (435) 864-6437
Fax: (435)864-0737
kenneth-n@ipsc.com

From: Ken Nielson
To: fpalacios@bbpwr.com
CC: Phil Hailes
Date: 9/30/2003 12:46 PM
Subject: Intermountain Power - Unit 2 OFA controls design information

Francisco,
I am currently assembling the construction package for the controls to be installed with the OFA system on Unit 2. In this process a few questions have come up on the U2 installation. I have listed those below.

1) Will there be any changes to the OFA controls and instrumentation design for Unit 2?

2) Are the same quantity and type (Jordan series 5200) of drives to be installed? Also the 5200s that were installed to replace the 5100s on the 1/3 drives on unit 1 included a position indication. IPSC would like this as well for all unit 2 drives.

3) During our discussions with Larry Boucher following the installation of the Unit 1 OFA system, Larry indicated that BPI was looking at moving the damper control linkage outside of the OFA ducts. Does the OFA design for U2 move the linkage outside the ducts? If so, will the location of the drives remain approximately the same?

4) Will there be any logic changes on the OFA controls design for U2?

Thank you in advance for this information.

Sincerely,

Ken Nielson

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
Phone: (435) 864-6437
Fax: (435)864-0737
kenneth-n@ipsc.com

From: Ken Nielson
To: fpalacios@bbpwr.com
CC: Bill Morgan
Date: 1/6/2003 9:19 AM
Subject: Re: Intermountain Power. Contract 100210 - Overfire air systemcontrols

Francisco,
Just a follow-up to our conversation on 1/3/03.

Bill Morgan has checked and verified that we have sufficient software and hardware blocks available in all microspec modules that will require modification for the OFA controls. As you will recall, we had some concern on the amount of spare capacity available on the microspec modules which control the secondary air dampers. Those concerns have been resolved.

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
(435) 864-6437
kenneth-n@ipsc.com

From: <fpalacios@bbpwr.com>
To: <KENNETH-N@ipsc.com>
Date: 2/11/2003 9:19 AM
Subject: Intermountain Power 100210- Jordan Drives
Attachments: Jordan 96D-042082-01.dwg; Jordan 92C-032073.DWG; Jordan 92C-032079-03.DWG; Jordan 95C-042094-01.dwg; Jordan 95C-042094-02.dwg; Jordan 95C-042094-03.dwg; Jordan 96A-029188.DWG; Jordan 96C-028662.DWG; Jordan 96C-042101-01.dwg; Jordan 96D-038915.DWG; Jordan 68C-027636.DWG

Attached are the latest Jordan drive drawings as promised. I also received information from Jordan indicating that limit switches could be added later on by a qualified plant technician.(See attached file: Jordan 96D-042082-01.dwg)(See attached file: Jordan 92C-032073.DWG)(See attached file: Jordan 92C-032079-03.DWG)(See attached file: Jordan 95C-042094-01.dwg)(See attached file: Jordan 95C-042094-02.dwg)(See attached file: Jordan 95C-042094-03.dwg)(See attached file: Jordan 96A-029188.DWG)(See attached file: Jordan 96C-028662.DWG)(See attached file: Jordan 96C-042101-01.dwg)(See attached file: Jordan 96D-038915.DWG) (See attached file: Jordan 68C-027636.DWG)

From: Ken Nielson
To: fpalacios@babcockpower.com
Date: 1/21/2004 12:17 PM
Subject: Intermountain Power CAMS Tubing Sketch
Attachments: North Side CAMS tubing sketch.pdf; South Side CAMS tubing sketch.pdf

Francisco,
Attached are sketches of the tubing to the CAMS systems for U1. As mentioned in the previous e-mail, there will be some changes in the exact position of the CAMS panels and the field routing of the tubing. But, this should give you and idea of how many 20' sections of 1/2" Stainless steel tubing stock will be required for this.

Also, another thing we did not discuss is the tubing connections for the purge air. This was done with copper tubing with filters and valves as shown. It was connected to an existing 4" copper ring header.

I will find out the type of air filters used. The sketch shows 3/4" tubing; but I think 1" was actually used because of the fitting size of the filters. Then it was reduced to 3/4" for connection to the CAMS. I will verify that as well.

Let me know if there are questions. Thanks,
Ken

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
Phone: (435) 864-6437
Fax: (435)864-0737
kenneth-n@ipsc.com

From: Ken Nielson
To: fpalacios@bbpwr.com
CC: Bill Morgan; James Nelson; Jerry Finlinson
Date: 12/30/2002 9:27 AM
Subject: Intermountain Power. Contract 100210 - Overfire air system controls

Francisco:
As I have been out of the office for a good share of the last several days, I am just checking in to see how things are progressing with the OFA controls design.

We will need to put our construction package together as soon as possible to meet our scheduling requirements. Accordingly, when do you estimate that the controls design will be completed for our review? Your e-mail of 12/11/02 summarized very well our discussions on the general hardware design. Have you encountered any problems or concerns since then with concepts we discussed? Also, Bill Morgan sent, and we presume that you have received, the SAMA diagrams of our existing secondary air controls. Do you have any concerns with the software changes we will need to implement for the OFA control? We would like to see the proposed software changes as soon as is possible.

Thank you for your efforts.

It is my hope that your holiday season has been enjoyable and wish you all the best of the New Year!
Sincerely,

Ken Nielson

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
(435) 864-6437
kenneth-n@ipsc.com

From: <fpalacios@bbpwr.com>
To: <kenneth-n@ipsc.com>
CC: <bill-m@ipsc.com>, <aaron-n@ipsc.com>, <csimmons@bbpwr.com>, <ddorman@bb...
Date: 12/11/2002 12:54 PM
Subject: Intermountain Power. Contract 100210 - Overfire air system controls

This serves as minutes on our telephone conference calls of today between Ken Nelson and Bill Morgan of Intermountain Power Service (IPS), and the writer. It also records various control design decisions and IPS requests on the reference subject:

We reviewed BBP's fax and sketch sent to Aaron Nissen on December 6, 2002 containing information on BBP's design. IPS gave answers to questions asked in the fax and also requested additional features in the airflow measurement. The highlights were as follows:

All 1/3, 2/3 and OFA feeder duct damper drives are Jordan, 120 VAC, and will be provided with servo-amplifiers capable of receiving a 4-20 mA demand signal and providing a loop powered 4-20 mA position feedback signal. Although BBP was planning to furnish the 1/3 and 2/3 dampers drives with remote servo-amplifiers and the OFA feeder duct damper drives with integral servos, IPS requested that all Jordan servo-amplifiers for all damper drives shall be remote and mounted on the two Jordan supplied NEMA 4 enclosures located on the front and rear of the units. IPS indicated that although Jordan shows a 50 feet distance limit between the drives and the remote servo-amplifiers in the Jordan catalogs, longer distances have been tested without problems and IPS does not object to the slightly longer distance between the OFA feeder duct damper drives and the Jordan boxes.

The 1/3 and 2/3 dampers are to be either open or closed commanded by the 4-20 mA demand signals. The drives are of intermittent service and not of continuous modulating service, but the 4- 20 mA design will provide this on off control and additionally provides the means to bias the damper opening limit position, boiler side to side, from the control room.

The OFA air flow elements will be as manufactured by Air Monitor Corp. IPS already has Air Monitor elements in the plant and are satisfied with them. BBP indicated that compressed air connections will be incorporated in the design of the sensing lines for periodic manual purging of these lines to rid them of flyash build up. IPS requested that automatic purging be furnished by adding the Air Monitor CAMS option, which also includes the DP transmitter, mass flow calculation capability based on a thermocouple located in the Air Monitor probe and complete control of the purge process. BBP indicated that this feature was not included in the contract and that an extra will be required. The commercial addition of this option for all four flow measurements will further be handled by Larry Boucher.

IPS informed that the existing DCS is a Foxboro Micro Spec and Video Spec 4 system of 1985 vintage that they will probably upgrade soon but not in time to incorporate the OFA project.

IPS inform also that total secondary air flow is controlled directly by the FD fan, which is axial with variable pitch control. The secondary

air pulverizer elevation dampers serve only to automatically bias the distribution of air to all elevations based on the pulverizer loads.

IPS will send BBP SAMA diagrams showing the existing secondary air controls.

BBP explained the initially proposed control of the new OFA as follows:
The 1/3 and 2/3 dampers will open following a program with boiler load as follows:
0 to 60% load: All 1/3 and 2/3 dampers closed
60 to 75% load: !/3 dampers open, 2/3 dampers closed
&5 to 90% load: 2/3 dampers open, 1/3 dampers closed
90 to !00% load all 1/3 and 2/3 dampers open.
(above load values to be confirmed during commissioning)
Control of the total overfire air flow will be achieved by the OFA flow control dampers located in the four OFA feeder ducts, using an OFA flow to total flow ratio controller with a ratio set point programmed with boiler load as index, and with the OFA flow signals as feedback.

From: Jerry Finlinson
To: Aaron Nissen; Garry Christensen
CC: Andy Chew; Bill Morgan; Dan Beistel; Dave Earley - Combustion Technol...
Date: 4/14/2003 3:50 PM
Subject: IPSC U1 PA Flow Traverse Results.
Attachments: MILL-B-50%-3-31-03.xls; PA Flow Traverse Results IPSC- JCF.xls

FYI,

I have included the spreadsheet of the PA Flow Traverse calibration results for Mills A through G done on 31 Mar and 1 April 2003 at IPSC with Dan Beistel of Air Monitor. In general, we are pleased with the results comparing our new pitot probes and CAMS system against the 3D traverse. We used all 9 test ports when doing these tests, except for a couple where the duct was interfering with the 9 ft probe. Using a 5 ft probe would have been preferable. A & E Mills were done with the 5 ft probe which arrived FedEx the 2nd day.

1) The measurement of the Pitot tube flows were were on average 1.93% higher than 3D traverse. The worst agreement was B mill with 3.37%, which was the first mill done. The best agreement was E mill with 0.21%. E mill has a new expansion joint, so it has the best air flow characteristics, with low turbulence. E mill was also done with a different probe.

2) The following potential errors, first the traverse probe thermocouple was not working, so we had to put in the average test temperature from the PI historian data, it was within 5 degrees of the temperature data recorded from the CAMS probe during the test. However, tests where the temperature was changing during the test will have slight flow errors caused by the temperature variation.

3) We wanted to compare against the actual data received by our control system. The averages from the PI historian during the test duration are listed in column O, PI AVG FLOWS. Comparing them against the 3D traverse gives errors averaging 3.4%, so the CAMS transmitter and our control system data input cards added an additional 1.4% error. There is a 9.5% difference on B mill 50%, that has not been explained. Take a look at the enclosed test data for B-Mill-50% and see if you can determine why the 3D probe values might be low.

4) It would have been good if the 3D probe data acquisition system time was synced with our clocks before starting the test. The raw data is about 35 minutes behind.

5) A Mill shows a low flow value for 90% feeder speed, it should have been about 220,000 lbm/hr, but was only 194,000. This was because the A mill damper is very stiff and needs new bearings or actuator work. The flow was drifting down during the test.

6) H mill was out of service for an overhaul.

7) We plan to put in K-factor corrections for the 2 to 4 % error corrections.

Dan, let me know if you have any corrections to the test spreadsheets.

Thanks, Jerry

Jerry Finlinson, Engineer
Intermountain Power Service Corp
850 West Brush Wellman Rd
Delta, UT 84624
435-864-6466 fax 0776/6670
jerry-f@ipsc.com

From: Ken Nielson
To: fpalacios@bbpwr.com
CC: James Nelson; Jerry Hintze; lboucher@bbpwr.com; Phil Hailes
Date: 4/16/2003 9:05 AM
Subject: Jordan Drive Requirements for Intermountain Power OFA Dampers

Francisco,
Per our phone conversation of today, I am getting back to you on the 5200 drives to be ordered.

My understanding is that you will order five (5) 5200 series drives. Four (4) of these will replace the 5100's on the 1/3 dampers and one (1) is to be our spare drive.

These should be rated for the higher, 1000 ft-lb torque rating.

We want them ordered with the sight window/indicator that shows the drive travel position. It is available from Jordan for an added cost of $120.

As far as limit switches and position feedback, we want that that same as the 5200s that we have. You and I had spoke about the option of ordering the drives with extra limit switches; but, after some discussion here, we have decided won't need extra limit switches beyond what is configured in the current drives.

One additional note: We have had a little trouble yesterday and today with one of the feeder damper drives binding. This seems to have been overcome by manually cranking the drive a couple of turns. Then the drive operates fine until it is parked for a period of time It may be that the 600 ft-lb rating of the drives for the feeder dampers is close to the marginal zone. We will keep you updated if there are further problems.

Let me know if there are concerns or questions with this information or with the ordering requirements on the new drives.
Thank you for your assistance,
Ken Nielson

Kenneth M. Nielson, P.E.
Lead Engineer, Technical Services
Intermountain Power
Delta, UT 84624
Phone: (435) 864-6437
Fax: (435)864-0737
kenneth-n@ipsc.com